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JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE PROMOTION OF THE MECHANIC ARTS.

DEVOTED TO

MECHANICAL AND PHYSICAL SCIENCE,

Civil Engineering, the Arts and Manufactures,

AND THE RECORDING OF

AMERICAN AND OTHER PATENT INVENTIONS.

EDITED BY

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JOURNAL

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JANUARY, 1859.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Practical Observations on the Introduction of Preservative Solutions into Railway Timber. By F. Hewson, C. E.

The use of timber upon our railroads is considered indispensable; it is everywhere found in the superstructure of our tracks, and forms the chief material of our bridges; its renewal is the most expensive item of repairs. The life of a sill seldom extends beyond eight years, and the rate of annual depreciation being $12\frac{1}{2}$ ℔ cent., can be applied to the estimate for the durability of the bridges, and those structures which are unprotected against the assaults of heat and moisture, the active and unfailing agents of decay.

There are cycles in the history of a railway like in that of nations; each has its era of good feeling, and the blessings of cheap government, to be followed by discontent and grievous burthens. The close of the first octennial period in the existence of a railroad track, is marked by the entire renewal of its wooden superstructure, involving an additional expenditure for labor. About a year or two preceding this troublesome epoch, the managers and proprietors become alarmed at the rapid and disproportionate increase in their repair accounts; the spirit of economy and reduction is infused into every department, and laudable efforts are made to restore the cheap management of previous years; those efforts are in vain, for the skill and fidelity of their officers and workmen cannot check the onward progress of perishable material to its destiny.

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Upon the 25,000 miles of the railway lines in the United States, it is here estimated that 3125 miles of the timber superstructure of their track are annually renewed, requiring an outlay of 3,500,000 dollars to furnish the supply.

These prefatory data show the importance of seeking some effectual method of arresting this enormous waste of capital. The chief obstacle to this end, has been the great outlay required in the outset for the apparatus employed by the usual process, which is so inconvenient in character as to preclude their adoption in the construction of our railroads. These objections of expense and inconvenience are applicable to the systems of Kyan, Bethell, and Sir William Burnett, systems which have been adopted upon the leading works of Europe, by engineers distinguished alike for their genius and soundness of judgment.

Kyan's process is the simple immersion of the timber in corrosive sublimate dissolved in water: it requires the employment of two tanks or reservoirs, into one of which the solution is pumped while the timber is being withdrawn.

It has been severely tested in the dock-yard of Woolwich, and has been employed with success on the Bavarian state railways. The writer has not been able to find any evidence against its efficacy.

The solution is an expensive one, besides being an active poison, which renders its adoption dangerous.

Bethell's process requires a strong cylindrical tank of iron, a steam engine, an air pump, a force pump, and a large wooden cistern or reservoir—when the timber is placed inside the cylinder which is air-tight, a vacuum is obtained, and the solution, which is either coal oil or pyrolignite of iron, is forced under a heavy pressure into the timber.

It has been successfully employed upon the Great Western, the Bristol and Exeter, Manchester and Birmingham, North Eastern, South Eastern, Stockton and Darlington, London and Birmingham, and Cologne and Minden railways. It has received the endorsement of Robert Stephenson, Brunel, Bidder, Braithwaite, and other eminent names.

Sir William Burnett's process employs the chloride of zinc, with the same apparatus and mode of operation used by Bethell. It has been successfully tested on the Hanoverian and the Cologne and Minden lines, and has been used on the Oxford, Worcester and Wolverhampton, the Oxford and Birmingham, and the Vale of Neath railways.

Brunel has taken an active part in its introduction on the public works of England.

There has been a want of confidence relative to the treatment of timber by other systems. The processes of boiling timber or heating it to a high degree of temperature, and suddenly plunging it into the solutions, have been condemned by the highest authorities.

In the Ordnance Manual for the use of the officers of the United States Army, edited by Major Mordecai, assisted by Colonels Baker, Ripley, Huger, and Major Symington, able officers, honored alike for attainments in science and services rendered under the flag of their country, it is stated that "kiln drying is serviceable only for boards

and pieces of small dimensions, and is apt to cause cracks and to impair the strength of wood, unless performed very slowly, and that charring or painting is highly injurious to any but seasoned timber, as it effectually prevents the drying of the inner part of the wood, in which consequently fermentation and decay soon take place. Also in noticing Earle's process, which consists in saturating the wood in a hot solution of copperas and blue vitriol mixed together, has been tried by the ordnance department, but the results have not been favorable as far as regards its effects upon the strength and preservation of the timber." Boucherie also mentions his want of success in rarefying by a regulated heat, the air included in the interior of the wood, and then plunging it at once into the solutions, which he wished to introduce, though by this method, he caused different liquids to penetrate materials of a very compact nature, and he succeeded in forcing tar into stones and bricks to a very great depth. The same authority states, "That it is infinitely more advantageous to act upon wood in its green state, than to prepare it after the time necessary for its complete dessication had sensibly altered it."

Tredgold, in his able and lucid manner, accounts for the effects upon the durability of timber produced by these processes which have thus been condemned—he says, "that it is well known to chemists that slow drying will render many bodies less easy to dissolve, while rapid drying, on the contrary, renders the same bodies more soluble; besides, all wood in drying loses a portion of its carbon, and the more in proportion as the temperature is higher; there is in wood that has been properly seasoned a toughness and elasticity which is not to be found in rapidly dried wood, and this is an evident proof that firm cohesion does not take place when the moisture is dissipated at a high heat."

The evidence of the Saxon and Bohemian railways given in the 29th number of the *Eisenbahnzeitung*, and translated to the valuable columns of the *United States Mining Journal*, practically confirms the unfavorable views of the authorities here quoted.

Additional adverse testimony could still be brought, but its introduction here would extend this communication to a wearisome prolixity.

The employment of the popular European methods of Bethell and Sir William Burnett upon American railways, which are too often started in haste, and without the means sufficient to properly complete them—would be attended with two objections, in some instances so weighty as to prevent their adoption,—they are,

1st. The expense in the first cost of the apparatus required.

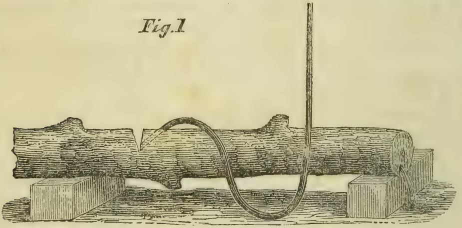
2d. The difficulty in its proper location along the line of a route under construction.

What is wanted is some process which shall be simple, cheap, and efficacious. Boucherie's system of introducing the solutions longitudinally, through the pores or tubes of the timber, by the pressure of a column of any convenient height, is a step in the right direction to meet these necessities. A description of his first methods of operating has already been furnished in previous numbers of the *Journal*.

An account of the more recent improvements which have been adopted is given by Mr. John Reid, Jr., of Glasgow; an extract will not be deemed irrelevant.

"After the tree has been felled, a saw cut is made across the centre through about $\frac{9}{10}$ths of the section of the tree, which is slightly raised at the centre by a lever or wedge so as to open the saw cut a little; a piece of string or chord is placed around the edge of the saw cut, and lowering the tree again, the cut closes on the string, which thus forms a water-tight joint; an auger hole is then bored obliquely into the saw cut from the outside, into which is driven a hollow wooden plug; a flexible tube is fitted on the plug, the end of which is made slightly conical, so that the tube may be pushed tight upon it; the fluid flows from a cistern at an elevation of from 30 to 40 feet." (See Fig. 1.)

Fig. 1



Mr. Reid further adds that the timber is most successfully operated upon within ten days after being felled, in which event, the process with a log 9 feet long will occupy twenty-four hours. If the timber is felled three months, three days are required; if four months, four days.

To expedite the longitudinal transmission of solutions, an ingenious and simple apparatus has been contrived by John L. Pott, Esq., the intelligent proprietor of the Orchard Iron Works, in Pottsville; some idea of which can be formed by the following description.

It consists of a force pump, to the cast iron frame of which is bolted a strong cylinder, also of cast iron, 9 ft. long; the inside diameter being 12 inches. Into the further end of the cylinder, a hollow cast iron collar is accurately fitted, but can be withdrawn and replaced at pleasure, the joint being water-tight—from the sectional end of the collar which is foremost in the cylinder, there extends a rectangular punch sharpened and edged with steel, the area of which being less than the cross section of the railroad sills in use. This is driven by beetles into the end of the sill placed in the cylinder, and then firmly secured by strong bolts connected with the apparatus.

This plan of cylinder head makes a water-tight joint, and at the same time allows the sap to escape, and secures a greater pressure at the end of the sill which lies against the pump. The power is applied by hand with a crank.

The writer experimenting with this apparatus, found that in certain classes of timber which were freshly cut, the sap would be driven out

with great force, rapidly followed by the solutions. This was noticed especially with the rock, red, and black oak sills.

Under a heavy pressure varying from 1000 lbs. to 1500 lbs. per square inch, working for about two minutes, the sap for a few seconds would be ejected from the end of the sill; this would flow sometimes in jets like the discharges from the common garden watering pot, and at other times trickling in frothing exudations.

It was found that in white oak sills under the enormous pressure of 1320 lbs. per square inch, the maximum gain in weight was 11½ lbs. per sill, or 3·8 lbs. per cubic foot.

In black oak under 800 lbs., the maximum gain was 17½ lbs. per sill, or 5·8 lbs. per cubic foot.

In red oak under 1400 lbs., the maximum gain in a sill was 29 lbs., or 9·6 lbs. per cubic foot.

In Chestnut under 1500 lbs. per square inch, the maximum gain in a sill was 13 lbs., or 4·3 lbs. per cubic foot.

Upon cutting the sills most successfully operated upon, into thin cross sections of two inches in thickness, they were found to be so fully saturated, that by striking them violently against a board, the solutions would exude and cover the surface with moisture.

Though it required but two minutes in operating the pump for the complete impregnation of the sills, yet the time occupied in adjusting and removing the sill, and in filling and draining the cylinder, amounted to 18 minutes, and the saturation of 25 sills was the average work accomplished in ten hours.

Boucherie's process is held in high esteem by his countrymen; it has been adopted on the Northern, the Eastern, and Nantes railways of France—and has been further sustained by a Board of Engineers of the Ponts et Chausées, and officers of Genise, in a favorable report to the Government.

It has certainly great merit, yet the importance of operating on the timber within a few days after it has been felled, and the manipulation required in its preparation, will cause inconvenience in the construction and repairs of American railroads.

After a close analysis of the cost and details of the various systems, the writer has been induced to select capillary attraction as the agent for introducing the solutions by the correct way shown to us by nature in the vegetative process, viz: by expelling and following the sap longitudinally, through the pores and tubes of the timber.

Preceded by a number of satisfactory experiments, the following plan has been adopted:

The sills are placed vertically with butt ends down in a tightly caulked rectangular tank, 14 ft. long, 6½ ft. wide, and 8 ft. deep, built of 3-inch plank supported by upright stays, and further secured by transverse bolts, which prevent the sides from spreading. (See Fig. 2.)

When the tank is packed with sills, sufficient solution is added to fill it to the top of the sills.

In this simple apparatus, the pressure of a column seven feet in height is thus maintained at the butt end of sill, the sap is expelled,

and the preserving solution takes its place—a tank holding one hundred sills will cost about $70, and weighing when empty, about 2 tons, it can easily be transported to any part of the road.

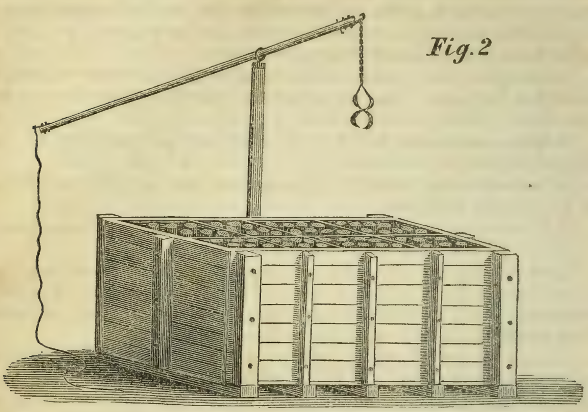


Fig. 2

The number and kind of timber operated upon, together with the weight gained, and the estimated quantity of solution absorbed, are given in the following table: The sills remaining seven days in the tank—the solution consisting of one part of pyrolignite of iron, and six parts water.

Kind of timber.	No. of sills operated upon.	Average pounds gained per sill.	Average pounds gained per cu. ft.	Average gallons per sill.	Average gallons per cubic ft.	Maximum gallons per cubic foot.
White oak,	1038	8·9	3·1	1·8	0·62	1·87
Rock oak,	96	11·5	3·9	2·38	0·78	1·87
Red oak,	153	10·0	3·9	2·04	0·78	1·70
Black oak,	903	9·6	3·6	1·87	0·72	2·64
Chestnut,	143	6·1	3·0	1·20	0·60	1·87
Hemlock,	617	7·5	2·6	1·51	0·52	1·87

After the lapse of seven days the increase of weight in the oaks appeared to be checked. The chestnut and hemlock being slower in absorption would require 14 days to complete their saturation. These facts ascertained by preliminary experiments, account for the discrepancy in the above table in the averages of these classes of timber.

The writer encountered some difficulty in estimating the exact quantity (liquid measure) of the solution absorbed, as the amount of sap displaced in the green timber is considerable, and consequently the estimate of the quantity of the solution absorbed from the weight

gained would be incorrect. After a careful investigation it was found that the increase in the measure of the solution received by the sill, averaged 70 ℔ cent. over and above the quantity called for by the gain in weight of the sill.

This increment is taken into the calculation of the gallon columns of the table.

In order to ascertain the relative extent or degree of absorption of the popular solutions by the different classes of timber, the writer caused to be divided into three equal parts, a rock oak, a white oak, and hemlock sill, each as thus divided was placed vertically in separate casks, which were filled with the solutions.

Cask with the chloride of zinc one pound to 10 gallons of water.
" blue vitriol one pound to 12½ gallons of water.
" the pyrolignite of iron (density 1·101), 1 part pyrolignite to 6 parts water.
After the duration of one week

The *white oak* stick in the chloride of zinc,	gained in weight,	6·8	per cent.
" " blue vitriol,	"	7·9	"
" " pyrolignite of iron,	"	10·7	"
The *rock stick* in the chloride of zinc,	"	4·8	"
" blue vitriol,	"	4·6	"
" pyrolignite of iron,	"	5·6	"
The *hemlock stick* in chloride of zinc,	"	9·7	"
" " blue vitriol,	"	10·1	"
" " pyrolignite of iron,	"	7·6	"

The blue vitriol is absorbed more readily by the hemlock, and the oaks prefer the pyrolignite.

For the impregnation of the heavy timbers used upon bridges and other structures, a large wooden cistern 4½ feet diameter in the clear, and 27 feet deep, was constructed of 3-inch seasoned white pine plank, tightly caulked in the seams, and bound with iron hoops; two courses of 3-inch plank were laid transversely and firmly secured at the bottom of the cistern.

This, when finished by the carpenters, was sunk into the ground until the top edge stood three feet above the surface. A hoisting crane is used in lifting the timber; the sticks being placed in a vertical position in the cistern, which should always be kept filled to its top edge with the solution—in this way, a pressure of a column of 27 feet in height is maintained at the butt end of the timber.

The following table shows the quantity of solution introduced into a cubic foot of the different woods—the solution consisting of one part of pyrolignite of iron and six parts of water:

Kind of timber.	Number of cubic feet.	Average absorption per cubic foot.	Maximum absorption per cubic foot.
White oak,	542	0·53 gallon.	2·72 gallons.
Rock oak,	833	0·71 "	2·04 "
Red oak,	39	0·93 "	1·87 "
Black oak,	67	0·85 "	1·45 "
White pine,	166	1·10 "	2·04 "

Timber freshly cut will receive the solutions more readily than when dry—some pieces of white oak which had been felled three months,

absorbed per cubic foot 76 ℔ cent. more than the same description and sizes of timber which had been twelve months felled.

It was also observed that in pushing some freshly cut beams with a sudden downward force into the cistern, the sap would appear on the top of the beam often in quantities to fill a wine glass.

These facts confirm the opinions of Boucherie, and show that the drying and seasoning of timber to prepare it for impregnation is an unnecessary waste of labor.

The expense of impregnating railway timber with the process advocated by the writer is but trifling.

The labor required is involved only in lifting and carrying the timber, and to this must be added the cost of the solutions absorbed. A statement of the cost of preserving sills with the usual antiseptics is here given.

Chloride of Zinc

In proportions used by Brunel, viz: one pound to 10 gallons of water—cost of chloride of zinc 9 cents per pound.

Labor at tank, lifting and carrying the sills,	1·0 cent.
Solution absorbed, 2 gallons,	1 8
Cost per sill,	2·8 cents.

Blue Vitriol

In the proportions adopted by Boucherie, viz: one pound to 12½ gallons of water, cost of blue vitriol 14 cents per pound.

Labor at tank, &c.,	1·0 cent.
Solution absorbed,	2·24
Cost per sill,	3·24

Pyrolignite of Iron

In the proportions adopted by the writer, viz: 1 part of pyrolignite to 6 parts of water—cost of pyrolignite 23 cents per gallon.

Labor at tank, &c.,	1·0 cent.
Solution absorbed,	6·5
Cost per sill,	7·5

The writer does not claim that this method of impregnating timber by capillary attraction is superior to any process extant, for such an assumption at this period would certainly be premature and somewhat arrogant. The question of its efficacy hangs upon a single point, which is this. Does it introduce a sufficient quantity of the preservative solutions to produce the desired effect? From the mass of data condensed in the tables given above, it appears that the average degree of absorption varies in the different classes of woods. The average of the sills impregnated in the tanks range from 0·52* to 0·78* of a gallon per cubic foot. The averages of the timbers in the cistern from 0·53* to 1·10* of a gallon per cubic foot.

In the interesting account of the Burnettizing establishment, at Gloucester, England, carried on under the direction of J. K. Brunel, Esq., C. E., published by J. B. Francis, Esq., it is stated in the course of describing the operation of the apparatus, that in a partial vacuum, a pressure of 120 ℔s. to the square inch is maintained from two to

* American gallons.

four hours until ·6* of a gallon of the solution is forced into each cubic foot of timber, and this amount is deemed sufficient. With this favorable and reliable evidence, the writer is sustained in the opinion that capillary attraction can be advantageously employed as the agent of introducing preservative solutions into railway timber. Its chief merit rests on the simplicity of its requirements in the outset, and the economy of labor in its use.

* Imperial gallons.

Pottsville, Pennsylvania.

Employment of Artillery in Public Works.

From "Nouvelles Annales de la Construction, August, 1858."

They are now working in the "Départment de l'Ariége, (France,) on the improvement of the Imperial Route, No. 119, which, according to the location adopted, passes through the grotto of Mas-d'Azil, which has already been opened. At the entrance of the grotto, and at the highest part of the arch, there hung an enormous block of stone, presenting a considerable surface and adhering in a very imperfect manner to the adjacent rock.

Suspended at a height of 197 feet (60 metres) above the road, this rock menaced the safety of the travel; it was very necessary to detach the parts threatening to fall, and to consolidate the rest.

The engineer in charge of the works, saw that in blasting under such circumstances, the difficulties were almost insurmountable, and it seemed that cannon only could dislodge this inaccessible obstacle.

He therefore wrote to the prefect of Ariége to ask him for the assistance of some artillery, when, fortunately, a battery of the 10th regiment of that arm passed through Labastide about ten kilometres from the grotto.

The officer of this battery, having received in the mean time by telegraph, orders to consult with the engineer, and to assist him, if possible, went on the 19th of June to Mas-d'Azil with two pieces (canons obusiers,) of four inches (0·12 m.) diameter.

He placed these pieces on the road at a distance of 820 ft. (250 m.) from the grotto, in such a position, that notwithstanding the height of the rock, the limit of the angle which the gun could make with the horizon was not passed. The two guns threw with a remarkable precision. At the fourth shot the operation was finished, all portions of the rock which had seemed not to be intimately connected with the arch having been removed. The large block remained, but was no longer menacing; to prove its solidity, several balls were lodged in an open crack on the slope of the hill, and during this firing no movement was manifested in the mass, although the projectiles were forced to break off the edges of the rock and to penetrate like wedges.

F. R.

*Experiments on the Absolute Strength of Iron and Steel.** By M. Meissner, Civ. Eng., Vienna.—From Jour. of Soc. of Engineers, Austria, 1858.

KIND.	Mark.	Dimensions in Vienna sq. inches. Breadth.	Depth.	Cross section, Vienna sq. inches.	Break'g weight Vienna pounds.	Breaking weight per sq. in.	Mean breaking weight per square inch.	Cross section of fracture square ins.	Cohesion shown by sect'n of fract.	Mean cohesion per square inch.	REMARKS.
1. Shear steel, hard,	I A	0·334	0·327	0·109	9795	89·860	86·852	A I 0·078	125·570	126·100	1. But little change of form just before breaking; without perceptible stretching; broken short; fracture fine-grained.
	B	0·327	0·329	0·107	9910	92·620		B 0·870	127·050		
	C	0·330	0·334	0·112	9650	86·160		C 0·075	128·660		
	D	0·332	0·332	0·111	9250	83·330		D 0·074	125·000		
	E	0·332	0·326	0·109	8970	82·290		E 0·073	123·000		
2. Shear steel, soft,	II A	0·334	0·330	0·110	8350	75·910	77·600	A II 0·065	128·460	130·000	2. (Broken quickly. The bars stretched perceptibly before breaking; fracture fine-grained.
	B	0·280	0·275	0·077	—	—		B 0·050	—		
	C	0·333	0·330	0·110	9100	82·730		C 0·075	121·340		
	D	0·336	0·329	0·111	8590	77·390		D 0·073	117·670		
	E	0·328	0·332	0·109	8100	74·310		E 0·053	153·000		
3. Cast iron, (bloomed with charcoal,)	III A	0·322	0·320	0·103	4300	41·750	41·180	A III 0·048	90·000	99·250	3. Stretched very perceptibly and very long before breaking. Fracture, fibrous, ragged.
	B	0·338	0·338	0·113	4680	41·420		B 0·049	95·520		
	C	0·338	0·338	0·113	4620	40·880		C 0·048	96·240		
	D	0·348	0·349	0·121	4870	40·250		D 0·050	97·400		
	E	0·332	0·320	0·107	4450	41·590		E 0·038	117·100		
4. Cast iron, (puddled with bituminous coal,)	IV A	0·261	0·262	0·068	2690	39·560	39·390	A IV 0·032	84·060	83·500	4. Like No. 3.
	B	0·258	0·252	0·065	2570	39·540		B 0·033	78·000		
	C	0·347	0·340	0·118	4590	38·900		C 0·055	83·460		
	D	0·262	0·259	0·068	2650	36·570		D 0·029	84·500		
	E	0·260	0·256	0·066	2800	42·420		E 0·032	87·500		
5. Cast steel, hard, (not easily welded,)	2 A	0·262	0·265	0·069	7500	108·700	110·190 without B.	2 A 0·048	156·250	148·120	5. Little change of form; no perceptible stretching; short fracture, very fine-grained.
	B	0·255	0·255	0·065	8950	137·690		B 0·062	144·340		
	C	0·261	0·260	0·067	7650	114·180		C 0·049	156·130		
	D	0·260	0·260	0·068	7790	114·560		D 0·055	141·640		
	E	0·271	0·263	0·071	7540	106·200		E 0·053	142·260		
6. Cast steel, soft, (capable of welding,)	4 A	0·336	0·338	0·113	11350	100·440	112·508	4 A 0·064	177·340	167·940	6. Stretched perceptibly before breaking. Fracture, fine-grained in middle; ragged at edges.
	B	0·342	0·338	0·115	14660	127·480		B 0·086	170·470		
	C	0·346	0·346	0·120	13520	112·670		C 0·975	180·300		
	D	0·346	0·346	0·120	13530	112·750		D 0·090	150·000		
	E	0·332	0·334	0·111	12120	109·200		E 0·075	161·610		
7. Cast steel, very soft, (easily welded,)	6 A	0·335	0·335	0·112	10020	89·460	88·976	6 A 0·062	156·550	160·400	7. Stretched until breaking. Fracture, fine-grained in middle; finely ragged at edges.
	B	0·352	0·350	0·124	11250	90·730		B 0·074	152·030		
	C	0·327	0·326	0·106	8950	84·430		C 0·047	190·410		
	D	0·334	0·332	0·111	9740	87·750		D 0·070	139·150		
	E	0·339	0·340	0·115	10650	92·610		E 0·065	163·850		

*Experiments on various modes of Raising Water.** By MM. Morandiere & Compaing.—*Annales des Ponts et Chaussées*, 1857.

Machine.	Day's work in hours.	Cubic metres of water raised by a man one metre high.		Daily wages of workmen.	Cost of 1 cubic metre of water raised 1 metre high.	Cubic metres of water which can be raised per hour.	Cost of hour's work.	Limits within which the method can be used.
I. Archimedes Screw.		per hour.	per day.	Francs	Francs		Francs	Metres.
1. Worked by men,	6	12·75	76·50	2·70	0·035	102·00	3·60	2—4
2. " horses,	—	—	—	—	0·009	85·50	0·75	"
3. " steam,	—	—	—	—	0·0043	165·00	0·70	"
II. Pumps.								
4. Worked by men,	6	9·00	54·00	2·70	0·050	54·00	2·70	1—8
5. " horses,	—	—	—	—	0·011	66·00	0·75	"
6. " steam,	—	—	—	—	0·006	79·00	0·47	"
7. Common water shovel	8	6·00	48·00	2·00	0·042	—	0·25	0—1·2
8. Holland "	8	15·00	120·00	2·00	0·017	—	0·25	"
9. Bucket,	8	4·00	32·00	2·00	0·063	—	0·25	0—1·8
10. Bucket with windlass,	6	15·00	90·00	2·00	0·030	—	0·45	4—20

* Zeitschrift, 1, 1858.

For the Journal of the Franklin Institute.

On the Calculation of the Earthwork of Roads on Sidelong and Irregular Ground. By Prof. Wm. M. Gillespie, of Union College, New York.†

A former article (published in this *Journal*, Dec. 1857, page 372,) investigated the nature of the warped surfaces of ground which usually form the upper or lower faces of the solids removed or added in road excavations and embankments, and showed that the contents of such solids could be calculated with perfect precision by the familiar prismoidal rule. It is now proposed to compare the results given by this rule with those obtained by the usual methods, and to establish formulas by which the nature and the amount of the errors which these latter involve can be determined in advance.

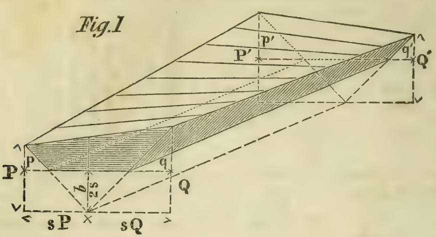
A type of the solids in question is represented in fig. 1, as an excavation seen in perspective. Inverted, it will represent an embankment.

To simplify the investigation, we will conceive the side-slopes to be prolonged till they meet, as shown by the broken lines in the figure. The conclusions at which we may arrive respecting the new solid thus

† An abstract of a portion of this paper was read at the late Baltimore meeting of the "American Association for the advancement of Science."

produced, will apply equally well to the original one, since the triangular prism which we imagine added, is common to both the solids discussed, whatever hypothesis we may adopt respecting their upper

Fig.1



surfaces. The additional depth is equal to the bottom width divided by twice the ratio of the base of the side-slopes to their height, or to $b \div 2s$, in the usual symbols. We will suppose the original outside depths p, q, p', q', of the end sections, to be increased by this quantity, and will call these new depths, P and Q for one section, and P' and Q' for the other.

Then the area of the triangle which forms one end of the new solid, is the difference between the trapezoid whose parallel sides are P and Q, and the two triangles which have P and Q for their altitudes and sP and sQ for their bases, and is

$$\tfrac{1}{2}(P+Q)\times(sP+sQ)-\tfrac{1}{2}P\times sP-\tfrac{1}{2}Q\times sQ=sPQ.$$

Similarly, the other end area is $sP'Q'$. The middle section will have the outside depths, $\tfrac{1}{2}(P+P')$ and $\tfrac{1}{2}(Q+Q')$. Consequently its area is

$$s\times\tfrac{1}{2}(P+P')\times\tfrac{1}{2}(Q+Q')=\tfrac{1}{4}s(P+P')\times(Q+Q').$$

The true content of the solid under consideration will then be

$$\tfrac{1}{6}l\left[sPQ+sP'Q'+4\times\tfrac{1}{4}s(P+P')\times(Q+Q')\right]$$

$$=\tfrac{1}{6}sl(2PQ+2P'Q'+PQ'+P'Q), \qquad (1)$$

We are now prepared to compare with this correct result those given by each of the usual methods of calculation.

I. The method of "*Averaging end areas*" will first be examined. This considers the content of the solid to equal the product of the half sum of its end areas by its length; *i. e.*, using the same symbols as above,

$$\tfrac{1}{2}l(sPQ+sP'Q'), \qquad (2)$$

The excess, if any, of the true content above this, will therefore be obtained by subtracting (2) from (1). It is found, after a little reduction, to be

$$\tfrac{1}{6}sl(PQ'+P'Q-PQ-P'Q') \qquad (3)$$

The value of this expression is not changed by substituting in it the original depths for the increased depths, (owing to its symmetrical character,) and it then becomes,

$$\tfrac{1}{6} s\, l\, (p\, q' + p'\, q - p\, q - p'\, q'), \qquad (3')$$

We infer from this formula, that *the true content exceeds the content given by "Averaging end areas"* whenever $p\, q' + p' q > p\, q + p' q'$; *i. e., whenever the sum of the products of the pairs of depths (or heights) diagonally opposite to each other, is greater than the sum of the products of those belonging to the same cross-section.* When the former sum is the smaller, then the true result is the smaller. The two sums are the same, and the results therefore equal, only when $p = q'$ or $q = q'$; *i. e.*, when the depths on one or the other side of the solid are the same.

It is so well known, however, that the method of "averaging end areas" *always* gives more than the true content of a prismoid, (such as a tapering stick of timber, a mill-hopper, &c.,) that there seems at first glance an apparent inconsistency in the above statement. The difficulty is removed, however, by the consideration that our warped-surface-solid is not a prismoid, although it is to be calculated by the prismoidal rule. A somewhat analogous case is that of a sphere, to which the prismoidal rule also applies, as shown in the ingenious paper of Mr. Ellwood Morris, in this *Journal*, 2d Series, vol. xxv., p. 381.

II. The method of "Middle areas" will next be taken up. This assumes the content to be equal to the product of the area of the middle cross-section of the solid by its length. This content will therefore be expressed in our symbols thus:

$$\tfrac{1}{4} s\, l\, (\text{P} + \text{P}') \times (\text{Q} + \text{Q}'), \qquad (4)$$

Subtracting this from the true content (1), we obtain, after a little reduction, for the excess of the former,

$$\tfrac{1}{12} s\, l\, (\text{P}\,\text{Q} + \text{P}'\text{Q}' - \text{P}\,\text{Q}' - \text{P}'\text{Q}), \qquad (5)$$

For the reasons before given this may be written thus:

$$\tfrac{1}{12} s\, l\, (p\, q + p' q' - p\, q' - p' q), \qquad (5')$$

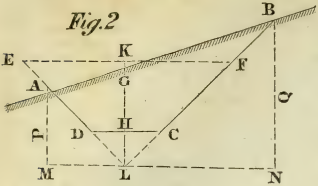
Comparing this expression with (3′), we see that we have merely to *reverse* the deductions there established; and that this method will give results too small when the preceding method gave them too great, and *vice versa.*

The absolute error, however, will be only half so great; the co-efficient in (5′) being only one-half so great as that in (3′).

III. The method of "Equivalent mean heights" (or depths) is now to be examined. It consists (as is well known to engineers,) in conceiving the given solid to be transformed in such a way that its top surface shall be a plane, every where level crossways at right angles to the length, and that the areas of the ends (which have then become level trapezoids,) shall, at the same time, be equivalent to the original areas. The method then assumes that the content of this new solid (which is a true prismoid,) is equal to the original content of the real sidelong, warped-surface-solid.

This is the method which it has long been customary to employ when perfect accuracy was desired; and most of the tables and diagrams for sidelong and irregular ground are constructed on this hypothesis. The question of its correctness is therefore an important one.

Fig. 2



In Fig. 2, let A B C D be one of the original end areas or cross-sections, and let E F C D be an area equivalent to it, but level on top, if in excavation, as here, or level at bottom, if in embankment. K H, the depth of this new cross-section, is called the "Equivalent mean depth (or height)" of the orignal cross-section. We have first to obtain an expression for it, in terms of the original side depths.

The investigation will be much simplified by the same conception as before, viz: by producing the side slopes till they meet, and calling, as before, the new outside depths P and Q. The height, K L, of the triangle E F L, is what is now wanted. The area of A B L was found on page 12 to be s P Q. Then the area $\text{EFL} = \frac{1}{2} \times \text{KL} \times \text{EF} = s\,\text{KL}^2$, being equated with S P Q, we obtain $\text{KL} = \sqrt{\text{PQ}}$.

The equivalent mean heights for the two end areas will then be $\sqrt{\text{PQ}}$ and $\sqrt{\text{P}'\text{Q}'}$; and the middle equivalent mean height will be their arithmetical mean. The corresponding middle area will be

$$\tfrac{1}{4} s\left(\sqrt{\text{PQ}}+\sqrt{\text{P}'\,\text{Q}'}\right)^2.$$

Using this middle area and the given end areas in the prismoidal rule, we obtain, as the content of the solid by this method,

$$\tfrac{1}{6} l\left[\,s\,\text{PQ} + s\,\text{P}'\,\text{Q}' + s\left(\sqrt{\text{PQ}} + \sqrt{\text{P}'\,\text{Q}'}\right)^2\right]$$

$$= \tfrac{1}{6}\, s\, l\left(2\,\text{PQ} + 2\,\text{P}'\text{Q}' + 2\sqrt{\text{PQP}'\text{Q}'}\right) \quad . \quad . \quad (6)$$

Subtracting this from the true content (1), we find the excess of the latter is, when reduced,

$$\tfrac{1}{6}\, s\, l\left(\sqrt{\text{PQ}'} - \sqrt{\text{P}'\text{Q}}\right)^2 \quad . \quad . \quad . \quad . \quad (7)$$

This expression is always positive, whatever the value of P, Q, P′, and Q′, with a single exception, when $\text{PQ}' = \text{P}'\text{Q}$. Hence we have arrived at this result: *The method of "equivalent mean heights" gives contents always less than the true content;* with one exception, viz: when the products of the pairs of heights diagonally opposite to each other are equal.

IV. Some engineers have conceived the surface of the ground lying between two such cross-sections as we have been discussing, to be formed by two triangular planes meeting in a line running diagonally from p to q', or from p' to q, (see fig. 1), and thus forming a ridge or a hollow situated in this line.* But such cases would be abnormal ones, and such ground would not "vary uniformly" between the cross-sec-

* See Mr. J. B. Henck's very valuable "Field Book for Railroad Engineers," page 100.

tions. We will, however, examine this conception, as it will lead us to some interesting results.

We will begin by supposing the solid to be bounded on its sides by vertical planes passing through the outer side-lines of its surface, and to have its base pass through the line in which the prolonged side-slopes would meet, so that the heights of its corners will be P, Q, P′, Q′, as in the preceding discussion.

Let now the diagonal be considered to run from the left hand corner of the nearest end of the solid to the right hand corner of the farther end; say, from the height P to the height Q′. We now have to get the middle area. The middle height of the diagonal $=\frac{1}{2}(\text{P}+\text{Q}')$. The middle width of the left hand side of the solid $=\frac{1}{2}(s\,\text{P}'+s\,\text{Q}')$, and the middle left hand height $=\frac{1}{2}(\text{P}+\text{P}')$. The middle left hand area is therefore

$$\tfrac{1}{2}\times\tfrac{1}{2}(s\,\text{P}'+s\,\text{Q}')\times\tfrac{1}{2}(\text{P}+\text{Q}'+\text{P}+\text{P}').$$

Similarly we get the middle right hand area

$$=\tfrac{1}{2}\times\tfrac{1}{2}(s\,\text{P}+s\,\text{Q})\times\tfrac{1}{2}(\text{P}+\text{Q}'+\text{Q}+\text{Q}').$$

The sum of these two areas gives the complete middle area. From it deduct the areas of the triangles on each side of the original solid. The left hand one has its height $=\frac{1}{2}(\text{P}+\text{P}')$, and its base s times that, and the right hand one has its height $=\frac{1}{2}(\text{Q}+\text{Q}')$, and its base s times that. Using the middle area thus obtained, with the end areas, in the prismoidal rule, we obtain the content of the solid on the new hypothesis. Its expression may be reduced to the following:

$$\tfrac{1}{3}\,s\,l\,(\text{P}\,\text{Q}+\text{P}'\text{Q}'+\text{P}\,\text{Q}'), \qquad . \qquad . \qquad . \qquad (8)$$

Subtracting this from the true content (1), we get for the excess of the latter,

$$\tfrac{1}{6}\,s\,l\,(\text{P}'\text{Q}-\text{P}\,\text{Q}'), \qquad . \qquad . \qquad . \qquad (9)$$

If we next suppose the diagonal to run in the other direction, *i. e.*, from Q to P′, we shall find the excess of the true content then to be

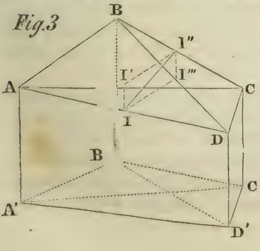
$$\tfrac{1}{6}\,s\,l\,(\text{P}\,\text{Q}'-\text{P}'\text{Q}), \qquad . \qquad . \qquad . \qquad (10)$$

Hence we infer that *the error on either hypothesis is numerically the same; though on one in excess and on the other in defect; but that the true content is the greater when the product of the heights which the diagonal joins is less than the product of the other two heights; and vice versa.**

* This admits of the following geometrical proof.

Let A B C D be the surface in question. Consider it to be formed by the two triangular planes A B C, A D C, meeting in A C. Conceive also a vertical plane to pass through A C, A′ C′, thus forming two truncated prisms. Next consider the surface to be formed by planes meeting in B D, and conceive another vertical plane to pass through B D, B′ D′. Two other truncated prisms are thus formed. Now conceive a plane parallel to A B and D C. It will cut the four planes of the hypothesis in lines parallel to A B and D C, and will thus form a parallelogram I I′ I″ I‴. The diagonal I I″ divides the lines A D, B C proportionally, (as follows from the similarity of the triangles formed,) and is therefore a generatrix of the warped surface which lies between the two pairs of planes. But this diagonal of course bisects its parallelogram; the same is true of any other generatrix; consequently the surface which they form is every where midway between the surfaces of the two pairs of truncated prisms, and is therefore equal to half their sum.

Fig. 3



It is in this way that the French engineers prove the theorems given in the note on page 375 of vol. xxxiv, Dec. 1857, of this Journal.

Some examples will show the practical bearings of the principles which have now been established.

Example 1. We will begin with the solid represented in fig. 1. It is an excavation a hundred feet in length, all the dimensions being given in feet. Its nearer end has the outside cuttings, $p=6$, and $q=15$; and its farther end has the outside cuttings, $p'=18$; and $q'=12$. The bottom width is 18. The side slopes are 1 to 1. The areas of the ends are 279 and 486. The middle area, obtained from the mean of the outside depths, is 391·5. Then *the true content* of the solid by the prismoidal rule, is 38,850 cubic feet.

Applying to this example the method of "Averaging end areas," we get a content of 38,250 cubic feet, or 600 cubic feet too little. It is too little, because the sum of the products of the depths diagonally opposite to each other is greater than the sum of the products of the depths belonging to the same cross-section. The precise deficiency is given directly by formula (3′).

The method of "Middle areas," gives 39,150 cubic feet, or 300 cubic feet too much; in accordance with formula (5′).

The method of "Equivalent mean heights" comes next. The formula on page 14, gives the "equivalent mean heights" of the two sections as 9·97366 and 14·81176 feet. Their mean gives a "middle area"= 376·65. The corresponding content = 38,860 cubic feet. The deficiency is 990 cubic feet. The same is given in advance by formula (7); since we have (adding $6 \div 2s = 18 \div 2 = 9$ to the original depths,) $P=15$, $Q=24$, $P'=27$, and $Q'=21$; whence,

$$\tfrac{1}{6} \times 1 \times 100 \left(\sqrt{15 \times 21} - \sqrt{27 \times 24}\right)^2 = 990.$$

The method of imaginary "Diagonals" gives 33,300 cubic feet, if we suppose the diagonal to run from p to q'; *i. e.*, from 6 to 12, thus forming a hollow; or 44,400 cubic feet, if it runs from p' to q; *i. e.*, from 15 to 18, thus forming a ridge. The deficiency in the former case is 5550 cubic feet; and the excess in the latter case is the same; conformably to formulas (9) and (10).

Example 2. Conceive the outside depths of the farther end of this solid to be interchanged, so that 12 may be on the left and 18 on the right. The true content will then be 37,950 cubic feet.

But "Averaging end areas" still gives the same as before, viz; 38,250 cubic feet. It was less than the true content in the former case, but it is now more, in accordance with formula (3′). The "Middle area" method gives 37,800, or too little, while before it gave too much; this result being still in accordance with formula (5′). "Equivalent mean heights" give the same as before, and therefore still too little.

Example 3. Conceive the depth q', of the solid of Example 1, to be changed from 12 to 15, all the other dimensions remaining the same. The new end area is 567, and the true content becomes 42,300 cubic feet. But $q=q'$. Therefore, according to the principles established on page 13, the method of "Averaging areas" should give the same result, and it does so. So too with the method of "Middle areas." The

method of "Equivalent mean heights," however, still gives too little, because P $\times$ Q′ is not equal to P′ $\times$ Q. On making the calculation (the equivalent heights being 9·97366 and 13·21475,) we get a content= 41,600 cubic feet, or 700 cubic feet too little; and formula (7) gives the same result.

Example 4. In another warped surface solid, let one end area have depths of 15 on the left and 5 on the right, and the other end be 5 on the left and 15 on the right. Let the breadth of road bed be 20 feet and the side slopes 2 to 1. The true content will be 38,333 cubic feet. The "Averaging method" gives 35,000 cubic feet; too little by formula (3′), because

$$5 \times 5 + 15 \times 15 > 15 \times 5 + 15 \times 5.$$

The "Middle area" method gives 40,000 cubic feet, an error in excess of half the amount of the preceding deficiency. "Equivalent mean heights" give 35,000 cubic feet; not enough, because P $\times$ Q′, or, 20×20 (adding $20 \div 2 \times 2$ to the given depths) is not equal to P′ $\times$ Q, or 20×20.

Example 5. Reverse one of these sections so that both may be 15 on the left and both be 5 on the right. The surface is then a plane, and the solid is a prism with a uniform section of 3500 square feet. For this solid all the methods give the same content; and this is a final corroboration of our formulas. The "Averaging" method is now correct, because $p = p'$, each being 15, or because $q = q'$, each being 5. The "Middle area" method is correct for the same reason. The method of "Equivalent mean heights" is now correct, because now P Q = P′Q.

The method of "Equivalent mean heights" which the preceding investigation most particularly affects, seems to have been introduced by Telford, and has since been adopted without question by most writers (the present one included,) *when perfect accuracy was desired.* The difficulty has been the want of any better standard than itself with which to compare its results. But if the positions which the former paper of the writer endeavored to establish be accepted as correct, this method should be at once and entirely abandoned—since its errors are not of the kind which balance each other in the long run, but are always on the same side—since they are committed too with a belief of its perfect accuracy, and therefore in the most important and delicate cases—and since they may sometimes be of serious moment, the deficiency of the first example given being more than $2\frac{1}{2}$ ℔ cent. of the whole amount; no trifling item in a class of work which on some railroads is counted by millions of yards.

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*Canals and Canal Conveyance.** By W. O'Brien, C. E.

[Extracts from the Prize Essay on Canals and Canal Conveyance for which a premium of £100 was awarded by the Canal Association.]

The dimensions of canals vary according to local considerations, and also according to the notions of engineers. In England there are two

* From the Lond. Civ. Eng. and Arch. Journal, Oct., 1858.

systems of canals: the narrow, with locks 7 feet wide, accessible to boats of 30 to 35 tons; and the broad, with locks 14 to 18 feet wide, and accessible to boats of 60 to 120 tons, the latter however being built without any regard to speed. In the broad canals the width at the surface of the water is about 40 feet. The canals in the north-west of France are accessible to boats of as much as 500 tons, if built in a certain manner, but few convey more than 200 tons freight. The locks most prevalent are 100 feet long by 18 feet wide, the depth of water being from 5 to 7 feet. A great many North American canals admit large vessels under sail. In the North Holland Canal two frigates can pass each other with ease.

A great number of rules have been given for calculating the resistance opposed to the movement of boats on canals; none of them can be relied on; in some cases they only give the relative and not the absolute resistance; in others they give the absolute resistance, but only for old-fashioned boats, which are not likely to be used much longer for traffic on canals. Some notion of the absolute resistance may be obtained from "Wood's Practical Treatise on Railroads."

The following formula is from Claudel's work:

$$E = k \frac{A V^2}{2 g}$$

E, effort in kilogrammes; k, coefficient constant with the same boat; A, area of greatest immersed transverse section in square metres; V, speed in metres per second; g, 9·81 metres = 32·17 feet.

If we reduce this to English measures, that is, pressure in pounds and length in feet, we have

$$E = 0{\cdot}80 \text{ K } AV^2 \quad . \quad . \quad (1)$$

K having the same signification as before.

K = 1·10 when the boat is a straight prism of which the length is 5 or 6 times its width.

If we suppose the front or bow of the boat to be formed by two vertical planes forming a certain angle with the longitudinal axis of the boat, the values of K according to this angle are

Angle of 78° ____ 30° ____ 6° ____ bow semicircular.

K = 1·05 ____ 0.48 ____ 0·44 ____ 0·57, and with a stern formed by two planes forming an angle of 45° with the boat's keel, these values are

K = 0·94 ____ 0·37 ____ 0·33 ____ 0·46.

K is stated with some fast American steamers to descend as low as 0·045.

The formula (1) shows that, all other circumstances being the same, the effort of traction increases as the square of the velocities; this appears to be true only up to a certain velocity, beyond which it appears that the boat is raised and displaces less water, so that the value of E increases less rapidly than the square of the velocities. The value of K is greater on a canal than in an unlimited expanse of water: cer-

tain experiments tend to show that there is a limit beyond which the diminution of the canal's sectional area does not raise the value of K, but is rather advantageous.

The duty performed by an engine in propelling a boat to a certain distance:—D is expressed by the equation

$$DE = 0{\cdot}80\ K\ AV^2\ D.$$

But if the work is done by a horse harnessed to a rope which forms an angle a with the direction of the boat's movement, the equation becomes

$$E.D \cos. a = 0{\cdot}80\ K\ AV^2\ D,$$

part of the horse's power being lost from obliquity of the rope.

Urging horses to a trot in towing boats appears to fatigue them very much, and was only practised for a short time with passenger boats. In France two horses haul a boat with about 100 tons at the rate of about 2 miles an hour. In England one horse hauls a boat with 20 to 30 tons at the rate of $2\frac{1}{2}$ miles. In Holland they go quicker.

For determining the power of the engines of a steamer, the dimensions of which are known, the formula given by Claudel in French measures is

$$\frac{F.Y}{75} = \frac{V^3}{2g} K{\cdot}A \left(1 + \frac{K.A}{K;A}\right)$$

which gives in English measures,—horse power, or

$$\text{H. P.} = 60.\ V^3.K.\ A\left(1 + \frac{K.A}{K;A}\right) \quad . \quad (2)$$

A is the area of one paddle-board or of two if two paddles are used, in square feet; V, the boat's speed in feet per minute; K, coefficient, varying from 1 to 1·2. This formula supposes the speed to be uniform.

The coefficients, K and K, can be determined approximately by comparison with boats already experimented on. K, may be assumed at 1·1.

If we determine, besides the speed to be attained, the dimensions of the boat and the probable depth of immersion, formula (2) will enable us to determine the horse power of the engines.

$$\frac{a\ \pi\ s}{33000} = \text{H. P.} \quad . \quad . \quad . \quad (3)$$

a, area of cylinder in square inches; π, effective pressure of steam on piston in pounds per square inch; s, speed of piston in feet per minute.

The effective pressure is here assumed to be that indicated by the pressure gauge; whereas it is always a little inferior in the cylinders, and varies if expansion is used,—as of course it should be.

If a screw is applied instead of paddles, formula (2) is still applicable, if A be equal to the area of the vertical projection of the screw, and V equal to the velocity of the screw in the direction of the boat's movement.

The shape and dimensions of boats used on canals can only vary within narrow limits. It was formerly admitted that the lines of ves-

sels should be convex in front: experience has proved that hollow lines are best, both for sea and river boats.

In Europe both river and sea going vessels are usually built with the stem raking forward: this creates a wave in front of the stem. The Americans have introduced the fashion of stems running straight up from the surface of the water.

The form of the stern lines has a great deal to do not only with the steering of vessels, but also with their speed.

Except in sea boats the form of a boat's lines above the water is of little consequence. Deep keel and great draft of water are necessary for the stability of sea-going boats. River and canal boats require a flat floor and no keel.

It cannot be expected that canal boats should be as fast sailers as river boats, but we should try and copy them as far as is compatible with the requirements of a canal navigation. Fine lines not only give speed,—they cause a saving in the cost of propulsion.

History of Canals.

Canals must have been used at a very early age, if not for navigation, at least for irrigation of land: they appear to have been made in Egypt at a very early period. Some time after, they were applied to the cultivation and irrigation of land in Lombardy. The first important step taken with a view to apply canals on a large scale to navigation, namely, the invention of locks, is attributed to Leonardo da Vinci, towards the year 1500. Notwithstanding the importance of this invention, inland conveyance by means of canals does not appear to have been much used till the year 1612, when a Frenchman (Pierre Paul Riquet,) presented Louis XIV. with a project for a canal from the Mediterranean to the Bay of Biscay, which was commenced under M. Riquet's auspices and at his expense. The execution of this canal has only been finished within a few years, and even now works are still going on for enlarging it and improving the supply of water. The works are let to a company, entitled Compagnie du Canal du Midi, by which name the canal is now known. This appears to have been the first attempt to make canals a general mode of internal communication. The Belgian and Dutch canals were begun before, but not under the same difficulties.

The Canal de Briare appears soon after the Canal du Languedoc; it was opened in 1642. England was far behind the continent in canal engineering; but when once the Duke of Bridgewater had set the example, the English capitalists set on in right earnest. It is a curious fact, that while on the continent the development of those two great instruments of progress, railroads and canals, was gradual, and can be traced rather to the increasing wants of the country, than to the leading influence of any individual; in England, on the contrary, their development was so rapid as to assume the form of a mania, and that almost entirely owing to a few men, more particularly Brindley for canals, and George Stephenson for railroads.

The French, however, boast of their Brisson, engineer-in-chief of the Ponts et Chaussées, who devoted several years to perfecting some of the most important canal lines in France, more particularly the northern navigation by St. Quentin and the Oise, the canal parallel to the Somme, and those from the Rhône and Marne rivers to the Rhine.

A canal cannot be too wide if it can be supplied with water. A blunder evident to all engineers was committed both in England and in France, in giving the locks, bridges, viaducts, &c., only just width enough for the passage of one boat, so that any considerable increase in the activity of the traffic or the size of the boats will compel the canal owners to pull them down and rebuild them entirely.

The idea of applying steam power on canals is as old as the application of the steamboat itself: it was tried on the Forth and Clyde canal in 1802, but was abandoned on account of the surge caused by the paddles washing the banks of the canal. In 1812, fresh trials were made, and the banks of the canal protected by a coarse stone pitching. The screw was tried with very good results on the grand canal in 1851. Paddle-boats have not been long in use on French and Belgian canals; the screw has only been in use since 1800, or thereabout, on French canals. Passenger boats tracked by post horses were tried in England and Scotland at the beignning of the 19th century, but were abandoned soon afterwards.

It must not be forgotten that canals were chiefly executed before railways were even thought of; they were made simply with the view of obtaining a better means of communication than that afforded by common roads. This explains the enormous value which canal property had in England for some years.

In Belgium, canals and railroads both belong to government; there has been scarcely any struggle between the railway and canal interests. In France the government owning most of the canals, and having advanced large sums of money for the construction of railways, was obliged to divide its solicitude between the canals and railways. In England the two systems led to a long struggle: the canal owners tried altogether to prevent the public from having railways, at least for the conveyance of heavy goods. After several violent parliamentary contests, the railway owners, not content with gaining their cause by obtaining an act of concession, turned all their efforts to ruin the canal owners by conveying traffic at the lowest rates, frequently at their own loss. Instead of trying to ruin the railway interest in England, the canal owners ought rather to have sought means of satisfying the public wants, in such a manner as to induce carriers to adopt the canal rather than the railway. But they had enjoyed for years such a complete monopoly, that improvement was thought of too late, and the canals were bought or silenced in many instances by the railway companies.

Present Position of Canals.

There are five different modes of conveying goods: 1. Coasting or maritime navigation; 2. Navigation on rivers; 3. Navigation on canals; 4. Common roads; 5. Railroads.

Wherever the first mode of conveyance can be adopted without materially increasing the distance, and if very great velocity is not required, it is and alway will be preferred. Allowing for sea risks, it is still the cheapest of all the five, and offers great facilities for loading and unloading, and for stowing goods in the best manner for their preservation. The application of the auxiliary screw system will not probably, on an average, raise the price of freight considerably, as the increase of working expenses which it causes is compensated by a great saving in time.

Common roads will ere long cease to be applicable except for short distances, or in very rugged and mountainous countries. They certainly offer one advantage: it is, that they can be made everywhere, and in some places offer the only mode of conveyance possible.

Railroads are less expensive, but except at high velocities are more so, than every kind of navigation. The characteristic advantage of railways is the enormous velocities which they allow one to attain.

The resistance on roads and railways is independent of the rate of velocity. On the latter it is about ·86 of that on roads. The resistance to a boat's movement varies as the square of the velocities, and at a speed little exceeding 4 miles an hour is superior to that on railroads. No limit scarcely can be assigned to the velocity attained on a railway. What advantages does navigation offer to compensate for the loss of such an important one as this? It offers first, that of economy; and secondly, that of being able to convey almost unlimited quantities in a given time; for we find in formula (1) that the resistance in this case varies but little with the length of the vessel, an increased length having only for effect a slight alteration in the value of K, so that thousands of tons can be conveyed by a single boat at sea or by a single train of boats on a river or canal, at a moderate expenditure.

Canals chiefly differ from rivers as regards the cost of conveyance, in requiring a greater outlay of capital, and being generally narrow, the motive power is not applied in the most advantageous manner; they are consequently less advantageous as a means of conveyance than rivers, unless the latter have a rapid current, or are much longer on account of windings.

The competition between railways and canals is a very serious question; the railway companies trying to absorb all the traffic of heavy goods, and run down the canal owners. It has been seriously considered by the French and Belgian governments, and has ended in their maintaining and even extending their canals, and reducing the tolls.

Having considered these five means of communication, it is easy to see that each of them offers special advantages, so that for many things it cannot be well replaced by any of the others; it is therefore not reasonable to suppose that one or two of them will absorb and supersede the others. None of them have attained the degree of perfection of which they are capable. If they had, the cost of conveyance of goods would not increase their value four or five fold, as is frequently

the case. Coal worth seven or eight shillings a ton at the pit's mouth is worth twenty or thirty at 200 miles distance.

It is argued against canals and in favor of railways,

1. That the cost of haulage is not much greater on railways than canals.

2. That railways offer such great advantages in point of speed as to compensate for increased cost of conveyance.

3. That it is quite practicable to convey on railways bulky goods, as building materials or minerals.

4. That if the profits derived by the conveyance of bulky goods are not very considerable, still the traffic can be absorbed, because a handsome profit is realized from the passenger traffic.

5. Puplic opinion is in favor of railways.

6. All canal property has lost a great deal of its value since the opening of railroads.

7. The continually increasing traffic on railroads proves that the public prefer that mode of conveyance for goods.

8. Canals are frozen, consequently impassable, for a certain length of time every year.

The first argument, that of cheapness, is not exact; up to a speed of about 4½ miles an hour the resistance on canals is, as we have seen, inferior to that on railways. The cost of establishment and that of repairs and management on canals are also inferior. The use of condensing engines and coal fuel render the cost of the moving power less by water than on railways, so that a speed considerably above 4½ miles per hour may be attained at a cost still inferior to that of railways.

The second argument is granted, but only with certain materials. Builders and contractors frequently order building materials and minerals three, four, and six months beforehand, without any inconvenience, and they have the great advantage of loading and unloading when it suits them; whereas with railways, space being valuable, all goods must be removed at the shortest notice, or else heavy dues must be paid for leaving the goods at the station.

Among the articles for which canals seem eminently convenient are the following:

Bulky articles—timber, bricks, stone, large castings.

Fragile articles—glass and pottery not packed in cases.

Articles of small value—ore, minerals, ashes, manure, &c.

Thirdly. It is very doubtful whether railways could furnish the sole medium for the conveyance of bulky articles. To do this the goods trains must travel at the same speed as the passenger trains, to the sacrifice of that important item of economy in the working of steam engines, expansion; if not, a third line must be laid down at a vast cost, for the sole transit of merchandize, or else the lives of passengers must be daily jeopardized to an extent far greater than what we observe even at present.

Fourthly. M. Perdonnet says that in may cases—as in that of the

French Northern Railroad, those of Rouen, Strasbourg, and Orleans, that from London to Birmingham and from London to Bristol—the profits derived from the conveyance of passengers and parcels suffice to pay the interest of the capital and the general expenses, so that the companies can content themselves with very small profits on the goods traffic. This is open to discussion, for it is very difficult to separate the passengers and the goods account so completely as to tell exactly what are the profits relative to each.

Fifthly. Public opinion is no criterion. There are many reasons why railways should attract public attention more than canals. The convenience in traveling, the wonderful speed, &c.

The sixth argument cannot be denied; but too much importance must not be given to it. Suppose, instead of constructing railroads parallel to those canals which have most suffered as a property since their establishment, we had established parallel lines of navigation,—would not the results have been very similar?

As to the seventh argument, it is refuted by observing that in France and Belgium the traffic on canals has gone on increasing since the establishment of railways parallel to them.

Eighthly. The effects of frost can only be palliated; but I think they are not more incovenient than a heavy fall of snow in a railway cutting, and are much less so than an interruption in the permanent way.

All these arguments therefore can only prove that canals have a severe struggle to keep up with railways. I will add in favor of maintaining, extending, and improving our canal navigation, that the public, whose attention has been entirely absorbed by railways, has neglected the vast field for improvement offered by canals in general, and by those of England perhaps more than any other.

How the struggle between railway and canal companies is to end is diffiult to say. United action on the part of the canal proprietors will be beneficial, and a community of interests between the canal owners and carriers will be still more so.

Attempts have been made to connect canals with irrigation of land, or with works for the supply of water, or with hydraulic machines for manufactures. The Canal de l'Ourcq, at Paris, serves both for the purposes of navigation and water supply.

As to irrigation and hydraulic machinery, they may in some cases be made a considerable source of income to the canal owners; but more generally all the water is absorbed for the wants of the canal.

Improvements suggested with reference to Canal Engineering and Navigation.

The first step towards improvement is the application of steam power to the exclusion of any other. The advantages offered by the use of steam, are:

1. *Economy.*—It is impossible to give any absolute estimate of the cost of conveyance with steamers and horses. The cost of steam power in particular is very variable; but the following estimate will give an

of the difference in the working expenses, exclusive of loading and unloading and general expenses, which are nearly the same in each case.

Suppose it be required to convey 60 tons 100 miles.—A boat hauled by one horse will perform the distance in 48 hours.

	£	s.	d.
The horse and driver at 6*d*. per mile will cost, . . .	2	10	0
Wages of crew, two days, . . .	1	0	0
Interest and wear and tear of boat, . . .	0	2	0
	£3	12	0

A steamer with engines of 16 to 20 H. P. can convey 60 tons 100 miles in 20 hours. The cost will be about as follows:

	£	s.	d.
Coal, 2 tons at 15*s*., ...	1	10	0
Wages of crew, one day, ...	1	0	0
Interest and wear and tear of engines and boat, . .	0	5	6
Oil, &c., ...	0	3	0
	£2	8	6
Difference in favor of steam power,	1	3	6*

Or nearly ·005*d*. per ton per mile.

2. The facility of increasing momentarily the moving power by reducing expansion and raising the pressure.

3. That of conveying indefinitely large quantities of goods according to the power of the engine, an object which cannot be attained with horses.

4. That of being perfectly self-dependent, whereas horses constantly occasion difficulties.

5. That of allowing the towing-path to be suppressed, causing a very great saving of space in deep cuttings and tunnels, which may thus be made available in other ways.

6. Saving of time. Any speed within 15 miles an hour is easily attainable, instead of 2 or 2½ miles, which is the pace of horses; but 4 or 5 miles an hour appear to be a good average.

Suppose a boat towed by horses to convey in one trip 60 tons to a given distance, and 30 tons back: the carrier will gain, say 20*s*. for the first trip, 10*s*. on the next; total, 30*s*.

The steamer will probably make two trips in the same time, conveying twice 60 tons to the same place, and twice 30 tons back. The boatman can make the same charge on each trip, and gain £3. But he will probably content himself with £2, thus sharing with the public the benefits derived by the improvement; and in any case a saving in time for the public will be effected. The number of boats forming the rolling stock will be diminished by half.

The next step is to introduce the *train* system. That towing is cheaper than carrying has been demonstrated more than once by actual

* This is so printed in the original, but it evidently should be £0 13*s*. 6*d*., or nearly ·0033*d*. per mile.

experiment. I have shown before that at a given speed the length of the boat makes very little difference, the area of the immerged transverse section having the most influence on the resistance, so that with an indefinitely long vessel the cost of traction would be but little increased: as this is impracticable, we must obtain an approximation by the use of boats towed one astern of the other. This system has been long in use in America. The introduction of steam necessitates certain alterations in the dimensions of canals: first, the section of the canals and the dimensions of the locks must be increased.

(To be Continued.)

For the Journal of the Franklin Institute.

Mid-Lothian Coal Mines, Virginia.—Cornish Pumping Engine, &c.

By Joseph Buzzo, M. E.

The mines of the Mid-Lothian Coal Mining Company are situated in Chesterfield County, thirteen miles from Richmond, and a half a mile from the Richmond and Danville Railroad—a branch track from that road connects the mines with their shipping point, opposite Richmond.

This Company has been formed and in successful operation for about 20 years. They now own about 2000 acres in the heart of the Chesterfield bituminous coal basin. The coal is considered of superior quality for gas, grate, and forge purposes, and finds a ready market. The average thickness of the seam of coal, varying from 4 to 50 feet, may be estimated at about 20 feet. Several vertical shafts varying in depths from 550 to 771 feet have been sunk through the vein at different points, and communication effected from one to the other, which gives good ventilation to the underground workings.

By the aid of three large hoisting engines they are able to raise a large quantity of coal. The Company are now engaged in sinking a new shaft near the centre of their ground, which they expect to complete in twelve months; and which, when completed, will open to them an additional valuable field of coal. About two years ago this Company leased a small piece of land adjoining their mines through which, than from any other point, coal could be more advantageously raised; and drove a drift into what was considered an unwrought piece of coal, when suddenly they cut into an old drift connected with extensive underground workings filled with water. This communication was at the highest point of the Company's workings; and as the old workings cut into were connected with vertical shafts 4 or 500 feet deep, and filled with water, the force with which the water poured into their works was enormous. It swept away thousands of the timbers in its route, washed up the railway tracks, knocked down large quantities of coal, in a few minutes filled the workings, and stood 40 feet above the drifts in the principal vertical shafts. This accident occurred fortunately

about midnight, when only 15 hands were below, ten of whom were lost. Previous to this the water had been kept out of the mines by large buckets fixed in cages and worked by the hoisting engines at night; but now so large a quantity had come in at once, and additional feeders having been cut, it was found that the whole power of all their hoisting engines, working day and night, was only sufficient to keep the water at bay, and that some additional power would be necessary to free the mines.

By taking accurate measurements of the buckets, and keeping an account of the number raised, it was ascertained that the quantity coming in in 24 hours was about 220,000 gallons.

It was determined to erect a pumping engine of sufficient power to drain the whole of the workings, leaving the hoisting engines for the exclusive purpose of raising coal.

After due investigation by the Directors in regard to the best kind of pumping engine now in use, in the course of which, advice was taken from various engineers, it was finally, only on the urgent recommendation and by the advice of Wm. W. Wood, Esq., Chief Engineer, U. S. N., that it was decided to erect a Cornish pumping engine, of the most improved kind. Proposals were invited from the principal foundries of the country for building such an engine. Those of Messrs. Merrick & Sons, engineers, and proprietors of the Southwark Foundry, Philadelphia, were accepted, and preparations immediately commenced at the mines for erecting the machinery. Here many difficulties presented themselves. All the fixtures and pit-head had to be removed, and it was then ascertained that the curbing timbers of the shaft would have to be renewed.

This was a work of difficulty and danger, for the soft nature of the materials near the surface caused the sides of the shaft to cave in as soon as the old timbers were removed. Great precaution had then to be exercised in saving the shaft and protecting the workmen. It was accomplished in five or six months without any injury to the men, and the shaft re-cribbed with foot square timbers.

The foundation of the engine house, which is within a few feet of the shaft, had to be quite deep, and from its great weight it was feared it would crush in the sides of the shaft. To prevent this, heavy timbers, 20 inches square and 28 feet long, were placed below the foundation between it and the shaft, and extending eight feet on each side of the shaft into the solid earth.

The foundation is of granite about 20 feet deep, the cylinder pillar of the same material and depth, and 17 by 24 feet. The beam (or bob) pillar, which is the front wall of the engine house, is of the same material, 24 feet wide, 6 feet thick to surface line, and 5 feet thick above that line, and 27 feet 6 inches above the surface. The rest of the engine house is of brick, with walls 34 inches thick. The boilers are in a separate house, in the rear of, and connected with, the engine house.

The engine is a "beam Cornish." Its cylinder is 60 inches diameter with 10 feet stroke of piston. The piston is packed with a single cast

iron ring, bored eccentrically and slit and tongued on the thinnest side; being kept central and in contact by four springs. The beam is of equal lengths, 28 feet 6 ins. from centre to centre of end pins, having wrought iron catch-pieces. It is double, and besides being of the usual proportion for strength, is banded by heavy wrought iron bands on the upper side, put on hot, and extending from under side of bosses around them, and over horns cast with the beams on their upper side. The total weight of the beam and centre shaft is 19 tons.

The cylinder is, of course, steam jacketed and cased as usual. The valve gearing is of the most improved kind, and for the purpose of gaining room, the exhaust chest is on one side of the equilibrium pipe, which is central. The exhaust pipe is carried through a trough supplied with cold water from the condensing cistern. There are two cataracts, one being applied to regulate the opening of the equilibrium valve. The steam arm passes through a slot in the (single) plug-rod, and is shut by a curved tongue piece, whose position is controlled by a regulating screw, of length sufficient to give the requisite variation in cutting off. The valves are opened by weighted pistons moving air-tight in cylinders on the cataract floor. The air pump is 26 inches diameter, 5 feet stroke, dipping into the condenser, and having in its bottom a grating carrying a circular gum foot valve. The bucket valve is also of gum; the delivery valve a cast iron float faced with wood. The injection valve is provided with a "wing throttle," opened and closed with the exhaust. The vacuum attained is 28 inches. The condenser and greater part of the air pump are immersed in the condensing cistern, and covered with water. A balance bob is on the surface connected to the main rod.

Steam is furnished by three single flue boilers, 6 feet diameter, 26 feet long, set below ground level. The flue is 45 inches diameter, containing at the firing end the grate, which is 6 feet 9 ins. long. The heated gases passing first through this flue, return at the sides to the front end, descend and pass under the bottom with the connecting flue to the chimney. This connecting flue contains a heater 30 ins. diameter, 28 feet long, through which the feed water passes before entering the boilers. Over the front end is a steam drum 30 inches diameter, 13 feet long, connected by pipes to stop-valves in each boiler, and from which rises the main steam pipe. The boiler shells and flues are of three-eighth-inch best Pennsylvania plates. The heads are of half-inch plates.

The chimney is 4 feet square in the flue, 70 feet high.

The feed water is supplied from an adjacent spring by a steam pump, the Mine water being too much impregnated with mineral substances.

This engine has been erected upon one of the deepest vertical shafts on the concern, which is 770 feet deep. The pit-work consists of three plungers and one drawing lift, each 10 feet stroke; the whole of them are of the same size bore, being 14 ins. diameter, as all the water accumulates to bottom. The main rod is of Pennsylvania pine; the first, 240 feet from nose of the bob, is 16 ins. by 14 ins.; the next 240 feet is 14 ins. square; and the remaining 240 feet is 12 ins. square—thus

making the entire length of main rod 720 feet. These rods are joined together by scrap-iron strapping plates 16 feet long, with 16 screw-bolts in each plate, and each joint having 4 plates. These rods are supported the whole length in guides (or stays) not exceeding 30 feet distant; these guides are of wood, 7 ins. by 10 ins., fastened into the wall of the shaft, and are held together by screw-bolts and iron glands, which at any time can be easily adjusted. At each set of those guides the main rod is protected by thin hard wood linings, and held to the rod by quarter glands screwed. Each plunger pole is screwed to the main rod by eight strong iron staples and glands, with a filling piece of wood 9 inches thick—the upper end of the stock works through a set of guides similar to those on the main rod. The main rod has four sets of catches, 3 of these on the down stroke and one on the up stroke of the engine, which prevents the whole machinery traveling beyond a given length of stroke in case of accident.

The foundation for each plunger consists of ten pieces of pine 12 ins. deep, fastened into the walls of the shaft in front of the main rod. And at one side of the rod cross timbers are again built upon these, four feet wide and five feet deep, fitted very snugly together, constituting fifteen feet of solid timber under the cistern, thereby preventing any spring or motion in the plunger or column on the turn stroke of the engine.

The stuffing-boxes are packed partly with Russian yarn and partly with gum; either of these alone was found not to answer so well.

The construction of the clacks introduced here, are what are commonly called the Gribble clack, consisting of a cast iron shell or lid, 1½ ins. thick, having a hinge which works upon a pin or bolt, supported by two loops fastened to the outer part of the seating. This hinge lifts about 2 ins. in the loops at every up stroke of the water. The shell has a groove one inch and a quarter deep by one inch wide all around, shaped to the face of the seat; in this groove four slips of sole leather are fastened on their edge, leaving a projection of ¾-inch for a beat upon the seat. The water ways through these clack seats and throughout the entire columns are the same in diameter as that of the plungers. Some of those clacks have been at work over six months without being re-geared.

This engine was started to work towards the latter part of last May, and in a few months drained the mines some 300 feet to the present working level, and the raising of coal has been resumed with vigor.

The usual speed in draining, was from 5 to 7 strokes per minute. At present the mine is kept clear by working at 4½ strokes about one day in six.

This is the first *pumping* engine of the kind which has ever been erected in this State. She works in admirable order, and for material and workmanship reflects great credit to the builders. The Company are moreover entitled to great credit for the foresight shown in providing in the erection of this engine a surplus power which will enable them to extend their operations to almost any extent. The hoisting engines are of the ordinary kind of high pressure, and coal is raised

by the cage and guide rods, with 4-wheel boxes which carry half a ton of coal in each box, and when at full speed it is estimated to raise sixty of those boxes per hour with each engine.

In view of the wide extent of territory, the superb machinery erected, and other facilities for making large and profitable returns, this Company may congratulate themselves as only on the eve of doing a wide and profitable business for many years to come.

AMERICAN PATENTS.

List of American Patents which issued from October 5 to October 26, 1858, (inclusive,) with Exemplifications.

OCTOBER 5.

1. Steam Boiler Furnaces; James Alcorn, Jr., Charlestown, Massachusetts.

Claim—1st, The arrangement of the chambers with their respective passages communicating with the smoke-stack, and the passages and the chamber communicating with the ash-pit. 2d, The arrangement of the cone pipe with its deflecting cover and the pipe, in combination with the chamber arranged in rear of, and communicating with, the ash-pit.

2. Gate; Silas Allington, West Dresden, New York.

Claim—The lever with its self-shifting weights, and its connexion to the gate, in the manner set forth.

3. Fly Trap; Bryan Atwater, Berlin, Connecticut.

Claim—As a new thing or manufacture, a fly-catcher, constructed with the notch or passage, arranged with respect to the upper edges of its side and two ends, and so as to operate substantially as described.

4. Animal Traps; Moses H. Biddle, Mount Carmel, Illinois.

Claim—The combination and arrangement of the pivoted bar, spring detent, and the spring catch. Also, the arrangement of the spring pulley, cord, and axis, of the revolving platform of a rat trap in combination, for the purpose of effecting a prompt revolution of the platform as soon as the detent is disengaged.

5. Rolling Window Blind; S. W. Bidwell, Hartford, Connecticut.

Claim—1st, So hanging the roller upon which the blind is hung, that it shall traverse in a horizontal plane (or nearly so), by means of the racks and toothed journals, or their equivalents. 2d, In connexion with the above, the combination with a rolling blind of a weighted cord, arranged with a helically grooved pulley on the end of roll, or in any other way substantially the same, for the purpose of counteracting the weight of the blind. 3d, The combination with the traversing roll of a weighted self-adjusting "friction fixture," consisting essentially of a weighted case and inclosed pulley. 4th, So arranging the tapes of a rolling blind with the shaft on which the slats are wound, that the slats may be shifted by the partial rotation of said shaft.

6. Slate Pencil Sharpener; William Burnet, City of New York.

Claim—The manufacture of a pencil sharpener made of inclined cylindrical rods having raised teeth upon them, either in the form of screw threads or sharp parallel ridges, and the attachment of these to any suitable plate or frame work of metal for securing the cylindrical bars or rods in their proper position, and for securing the whole to the frame work of the slate.

7. Screw Propeller; Oliver Byrne and J. G. Elliott, City of New York.

Claim—The device and method described, or their equivalents, for conducting useless or superfluous water to the rear of a screw propeller in immediate contact with the blades aft, not for the purpose of giving a rotary motion to the propeller, but for the purpose of diminishing what is termed "slip," by the operation and methods described.

8. Deflecting Plates for Circular Saws; J. D. C. Carpenter, Cincinnati, Ohio.

Claim—1st, The rotary deflecting plate or spreader, provided with an adjustable friction bearing, as set forth. 2d, The cutters placed near the margin of the deflecting plate, substantially as set forth.

9. Carpet Stretcher; W. S. Cowant, City of New York.

Claim—A carpet stretcher made by combining the clamp and wedge with the other necessary parts of a carpet stretcher, as set forth.

10. Lubricating Car Axles; John W. Cochran, City of New York.

Claim—In connexion with the spring and wheel, the inclined diaphragm, having the space for the play of the wheel, and access to the wheel and spring, as described.

11. Washing Machine; Samuel W. Cole, Millington, Maryland.

Claim—The combination of the lever, E, shaft, C, and hinged levers, b b, with each other and with the rubbers, for the purpose of moving said rubbers in contrary directions at the same time, and allow the upper rubber to rise and fall, to adapt itself to the clothes.

12. Cam for Throwing Bolts in Locks; Henry W. Covert, Rochester, New York.

Claim—The combination of the cone or wedge-shaped centre with the socket or outer rim, to form a cam for throwing the bolt to the lock.

13. Fog Signal Machines; Joseph D. Custer, Norristown, Pennsylvania.

Claim—The application to fog signal machines, magnetic telegraph registering machines, &c., of my improved retaining power, including pinion, I, wheel, J, shaft, K, pinion, L, wheel, Q, click spring, and balance piece, when arranged to form an adjustable and durable retaining power.

14. Knives to Cut Paper Bags, &c.; Henry R. Davis, City of New York.

Claim—The serrated knife having a vertical movement, in combination with the narrow slot in the bed plate for sustaining the paper while several thicknesses are being cut for bags or other irregular forms, as set forth. Also, forming said serrated knife with alternate long and short serrations, for piercing and cutting several thicknesses of paper.

15. Railroad Switch; Charles C. Dodge, Marshall, Michigan.

Claim—The application and use of the combined arrangement of the grooved or threaded cylinder, lever, guide pin, pivoted target staff, pin tie bar, and box, for the purpose set forth.

16. Folding Guides; Alexander Douglas, City of New York.

Claim—The peculiar flattened tube, folded upon itself, as described, so as gradually to fold the enclosed material along three lines, and at the same time to support it on all sides, and preserve its stiffness at all other points, substantially as described.

17. Carpet-Sweeper; Jacob Edson, Boston, Massachusetts.

Claim—1st, The arrangement described of hanging the brush at or near one of its journals in a bridle, and attaching the opposite end of the said bridle at a point on the case of the machine between the centre of the driving-wheel and the other journal of the brush, whereby the machine is made self-adjusting, so as to adapt itself to heavy or light sweeping. 2d, Attaching the handle of the machine to the bridle at a point near the driving-wheel instead of in the centre of the machine. 3d, Forming the entire machine of a tapering shape, as described, whereby the brush can work successfully in the corner of an apartment to be swept. 4th, The combination of the revolving brush, having the bristles arranged spirally thereon, with the tapering shaped dirt-receiver, so as to sweep and convey the dirt into the larger end of the receptacle. 5th, Combining in one the door for removing the dirt and the dirt receiver, by constructing it as described.

18. Steam Plough; James W. Evans, City of New York.

Claim—1st, The combination and arrangement of the main shaft and cranks, forming part thereof with the main axle and driving-wheels, by means of screw shaft, and the bevel, and the screw thread upon the axle, so that by the action of the piston rod attached to crank, the reciprocating action is communicated to the ploughs, and at the same time the machine is moved forward in due proportion to the stroke of the ploughs by the rotation of wheels, and thereby cutting a continuous furrow by a rectilinear and direct thrust of the plough or ploughs. 2d, The construction and arrangement of the supports or guide pieces, the pairs of vertical rods, operating by means of the eccentric, and the lever and arm, in the manner described, for guiding, securing, elevating, and lowering the plough.

19. Grain Cleaning Machine; W. T. Fisher, Cleveland, Tennessee.

Claim—The oscillating blast and screen spout, scourer, blast spouts, and fan, combined substantially as set forth.

20. Rolling Railway Iron; John Fritz, Johnstown, Pennsylvania.

Claim—So arranging of "three high" rolls for railroad rails, bars, or beams, as that said rails, bars, or beams may be rolled or reduced as they pass both forward and back, and so that each succeeding pass shall roll down the fire formed at the preceding pass, and avoid any necessity of turning the bar as heretofore done. Also, in combination with the top of the series, or with any roll of a series which performs its duty, the yielding clearer or guide, or its equivalent, for preventing the bar, rail, or beam from winding on said roll.

21. Cotton Scrapers; C. A. Gaines, Watson, Mississippi.

Claim—Giving a hollow or concave form to the bottom of the block from the rear and side edges inward, and forward to the mould-board or scraper.

22. Gas Metres; Joseph E. Fisk, Salem, Massachusetts.

I do not claim the employment of two flexible bellows in two separate chambers. Nor do I claim the mode of constructing the flexible bellows, as exhibited in the United States patent numbered 9591, wherein such bellows is made of two metallic shallow dishes or partitions joined at their edges by a flexible connexion. This differs essentially from my invention, wherein a sack, I or J, separate from and arranged within a flexible enclosing case, M or N, is employed, as in my invention the sack alone constitutes the gas-receiving chamber, and can be readily removed from its flexible case whenever necessary, without requring the enclosing case to be removed from the metre.

Claim—The described improved arrangement of the partition, K, and the shaft, D, the cranks, valve, C, and valve seat, B, with respect to the chambers, E H and A, and the pipes or passages, a b c d, the same enabling one shaft, D, only necessary to the operation of the valve by the two sacks, I and J. Also, combining with each flexible sack, I J, a flexible enclosing case, M or N, arranged so as to operate therewith, as specified. Also, the arrangement and application of the pipe, F, with respect to the valve, C, and the case of the metre, the same being in manner and for the purpose as specified.

23. Hay Rakes; Peter Fitzgerald, Constantine, Ohio.

Claim—The combination of the shafts, and the clutch, and brake, with the levers, bar, handle, and cam, for the purpose of putting the brake and clutch in operation, as described.

24. Washing Machine; John Fordyce, Morgantown, Virginia.

Claim—In combination with the reciprocating plunger, the tipping rack, and the stationary rack teeth, the three parts operating together in the manner set forth.

25. Gearing for Cut-off Valves for Steam Engines; P. W. Gates, D. R. Fraser, and Thomas Chalmers, Chicago, Illinois.

Claim—Working the cut-off valves, D D, in combination with a main slide valve or separate main slide valves of the character described, by means of the pawls, k k′, to lock the cut-off valves with the main valve or valves in an open condition, the variable or adjustable slides, p p′, to disengage the said pawls, the stops, 3 3, to stop the said cut-off valves in a closed condition after their liberation, and stops, y y y y′, to stop and open them by the completion of the stroke of the main valve or valves.

26. Sewing Machines; Wm. O. Grover, Boston, Massachusetts.

Claim—1st, The combination of a cylinder, and plunger, and needle of a sewing machine, in the manner specified. 2d, A slot, or its equivalent, for the purpose specified, in combination with the guiding mechanism of a sewing machine needle.

27. Sewing Machines; Wm. O. Grover, Boston, Massachusetts.

Claim—1st, The combination with a curved needle or hooker-on, or looper, of an irregularly shaped spiral shaft and a reciprocating driver, both substantially such as before specified, and constituting an apparatus for imparting the required motions and pauses to a crooked needle. 2d, Mounting a driver, combined with, and acting upon, a spiral shaft, with a spring or springs. 3d, Combining such springs with layers of raw hide, leather, or similar material, when acting upon, and in combination with, a spiral shaft. 4th, An actuating surface, so formed as to surround or embrace an irregular screwed shaft, and at the same time free to slide in a driver, in planes perpendicularly, or nearly so, to such a shaft.

28. Sewing Machines; Wm. O. Grover, Boston, Massachusetts.

Claim—The combination of a spring, a bar attached to or making part of a slide and resting upon a cam, and a cam shaped substantially as specified, when these parts are held in working position and connexion by the spring, as there is no attachment between the bar and the cam, all these parts being substantially such as are before described, and acting severally and in combination, substantially in the manner specified.

29. Sewing Machines; Daniel Harris, Boston, Massachusetts.

Claim—Driving the needle arm and the apparatus for effecting the feed and for forming the loops in sewing machines, by means of a pulley provided with an india rubber ring, or its equivalent, and hung in brackets cast on to the bed plate, in combination with a fly-wheel also hung in brackets, but which are attached to the table, said pulley and fly-wheel being arranged in relation to each other, so that they may be readily thrown into or out of working contact, as set forth. Also, the peculiar construction of the hollow goose neck, when so shaped as to admit of the insertion of a bent needle arm, and the vibration thereof upon a fulcrum within said goose neck, in the manner specified. Also, for feeding the cloth, or other substance, in sewing machines, the feed hand connected by means of a yielding joint with the slotted plate containing the slide, and forming therewith a parallelogram opening in combination with a vibratory needle stock having a pin projecting into said slot, so as to operate in the manner described.

30. Carpet Sweeper; Daniel Harris, Boston, Massachusetts.

Claim—The arrangement of a revolving brush driven by means of a padded driving-wheel from one side only within a semi-cylindrical casing, provided with stationary pockets and deflectors in front and rear of the said brush.

31. Haltees and Bridles for Horses; S. C. Hawkins, Patchoque, New York.

Claim—Forming the ring with a flanch, and securing the straps to the ring by rivets, which pass through the straps and flanch.

32. Machine for Cutting Laths; Reuben Haynes, Oberlin, Ohio.

Claim—The arrangement of the curved slot and lever, in combination with the revolving sliding shafts and gears, when arranged as described, for the purpose of raising and giving a throw to the log conjointly, and acting with the immediate gearing, in the manner described.

33. Construction of Animal Traps; Edmund Hill, Cincinnati, Ohio.

Claim—The ridge or step, in combination with the door and lever, for the purpose of re-setting the trap.

34. Baggage Checks; Edmund Hoole, Mount Vernon, New York.

I do not claim, broadly, stamping or engraving the names of the different stations on one plate or check, one at each side, for it is quite common to employ both sides of signs, slates, &c., for analogous purposes, and the mere employment of both sides of a baggage check for directory surfaces, even if practicable, would not be invention. Therefore, I

Claim—Stamping, engraving, or otherwise marking on the plate or check, A, the names of two different stations, one at each side, when said plate thus stamped or engraved is used in connexion with a strap, B, attached to the plate, and rendered capable of being adjusted as shown, for the purpose specified.

35. Packing Pistons for Steam Engines; Hanford Horton, City of New York.

Claim—The application of the figure 8, or other appropriate spring, between the upper and the lower set of metallic cylinder rings, as described, by which an upward and a downward pressure is obtained on said rings. I do not claim the application of springs to produce an outward pressure, said springs acting on a single or spring ring which keeps out the two cylinder rings, as that has heretofore been in use by others as well as myself. But I do claim the combination of the six rings, a 1 2 3, b 1 2 3, with the figure of 8, or other appropriate spring, between them to produce an upward and downward pressure, in combination with the figure of 8, or other appropriate spring acting on the two spring rings, producing an outward pressure on the four cylinder rings, thus making a steam tight joint on the upper edge of the upper cylinder ring, as well as on the lower edge of the lower cylinder ring, and also on the cylinder surface of the cylinder rings.

36. Photographic Baths: Bernhard Hufnagel, City of New York.

Claim—The construction of a silver bath for photographic and ambrotype purposes, made out of two plates of glass, with india rubber between, and fastened together between wooden or other frame work, in the manner described.

37. Hemp Brakes; Wm. C. Hutchinson, St. Josephs, Missouri.

Claim—The tooth, described and illustrated in the drawings, as constructed, to be used in the drums of cylinder hemp brakes. Also, the combination and arrangement of the pendant scalloped edge swingle, with the sliding or reciprocating double jaw hatchel, arranged and operated substantially in the manner described.

38. Harvesters; G. F. and Moses Jerome, Mineola, New York.

Claim—The guard formed with an oblique portion, in combination with the seat placed relatively with respect to each other and the platform, as described.

39. Valves for Steam Engines; Joseph Jobin, St. Maude, France; patented in France April 13, 1858.

Claim—The sliding balance valve, constructed of a prismatic or partly prismatic form, and guided in its reciprocating travel by and within a steam chest open or closed at its ends, but surrounding in a close manner the sides of said valve.

40. Apparatus for Raising Dough for Bread; Josee Johnson, City of New York.

Claim—The double brake, in combination with the conical shield, operating as described.

41. Ballet-Box; S. C. Jollie, City of New York.

Claim—The employment of a glass globe in the construction of a ballot-box, by mounting the globe as described, so that it shall be simply held in place without concealing the contents, and having a hole at top of sufficient size for the hand, which hole is to be provided with a hinged cover with a hole of the required size to drop the ballots through.

42. Card Clothing; Richard Kitson, Lowell, Massachusetts.

Claim—Constructing the teeth, so that when in place their points are below or less prominent than, and protected and guarded by, their thick parts or heels.

[This invention consists in so forming the pointed teeth of "card clothing" for cotton gins and wool-burring machines, that when the clothing is wound upon a cylinder or fastened to an endless belt, the points will be below the thick parts of the wires, and the thick parts of the wires will form smooth surfaces for the feeds or burrs to roll upon, and thus prevent them from coming in contact with, and being broken by, the points, and also the teeth from being damaged. By this intervention the only objection to the use of toothed surfaces for ginning cotton and burring wool, namely, the breaking of the seeds or burrs, and the liability of damaging the teeth are overcome.]

43. Water Alarm for Steam Boilers; Levi E. Lincoln, Lowell, Massachusetts.

Claim—1st, The application of an alarm whistle exclusively to the water space of a steam boiler to obtain controlling motive power, in conjunction with an application exclusively to the steam space of said boiler, to obtain warning or acoustic power. 2d, The application of a self-adjusting valve to the stem of a steam whistle, in manner such that a current may be intercepted thereby. 3d, The application to a whistle of a metallic tube or pipe, in such manner that unexpanded it shall be pendant from the whistle, and that by expansion and contraction it shall have the office to effect the operation of the whistle. 4th, The application of a set-screw, or mechanical equivalent, to an expansive tube, in such manner that the effective expansion and contraction of said tube may be prescribed thereby. 5th, The application of a whistle to its support, standard or frame work, in such manner that the whistle shall be suspended from said frame work by that portion of itself which extends upward from its bell. 6th, The holding of a valve seat in position for its valve by pendulous attachment by suspension. 7th, The operating of a valve seat upon its valve by the expansion and contraction of a metallic tube, or by the expansion and contraction of any mechanical equivalent thereof.

44. Spark Arresters; Joseph Marks, Boston, Massachusetts.

Claim—The combination of the petticoat pipe, the surrounding wire net work, and the smoke pipe, whereby, while a free exit passage is secured for the exhaust steam, an intermittent draft is produced upon the outer surface of the wire net work, which pulverizes the sparks and retains them until they are consumed, as set forth.

45. Mode of Transmitting Magnetic Signals on Railroads; Henry Maule, Philadelphia, Pennsylvania.

Claim—Securing to a railroad a series of conducting rails independent of those of the track, and placed in pairs, one pair being disconnected from the next pair throughout the series, and each pair of conducting rails being arranged to connect with a galvanic battery on the train by the devices described, or their equivalents, one rail of each pair to one pole and the other to the other pole of the said battery, and the latter being connected to any suitable indicating apparatus situated on the train, as set forth.

46. Bank Locks; L. H. Miller, Providence, Rhode Island.

Claim—1st, A series of slotted sliding tumblers within a sliding box, arranged in such relation with the bolt or bolt latch, that each tumbler will require to be adjusted separately, in order to allow the bolt to be shoved back, and the lock unlocked. 2d, The arrangement of the hollow arbor, rod, lever, and tube, with projection attached, in connexion with the notched disk and click, and a key, constructed as shown, or in an equivalent way, whereby the tumbler box is moved the correct distance for the several tumblers to be brought in line with the projection, and the several tumblers adjusted at each movement of the box. 3d, Operating the sliding tumbler box from the arbor, by means of the part pinion and the rack of the plate, arranged in such relation with the dogs, slide, and bolt, that by the time the tumblers are all properly adjusted, the dogs will respectively raise the latch and throw back the bolt.

47. Cultivators; B. S. Morgan, Delhi, Iowa.

Claim—The arrangement of the bars with share stocks attached, the levers with links fitted in the triangular shaped openings in said levers, and attached to the coulter bars which are connected to the levers. Also, in combination with the above, the brace rods, attached to the share stocks by means of the springs, and fitted in the recesses in the stocks.

48. Trip Hammer and Anvil; D. A. Morris, Pittsburgh, Pennsylvania.

Claim—The arrangement of a gang of trip or tilt hammers in connexion with the movable anvil, constructed in the manner specified.

49. Rolls for Making Sheet Iron; D. A. Morris, Pittsburgh, Pennsylvania.

Claim—The employment of mottled chilled iron rolls for rolling sheet iron, when constructed as described.

50. Distillation of Fresh Water from Salt Water; A. Normandy, London, England, a citizen of France.

Claim—The process set forth, by which ærated and non-ærated fresh water are obtained by distilling sea water.

51. Steam Water Tank; S. H. Yocum and J. O. Byrne, Shelbyville, Indiana.

Claim—1st, The extension of pipe, B, above the bottom and inside of tank, A, in combination with valve, C, and gauge, U, or their equivalents, in the manner set forth. 2d, The flexible pipe, D, and stop cock, G 2 and M, in combination with the plexus, O O, and air-tight tank, A, as set forth.

52. Apple-paring Knife; Adam Oat, Minetto, New York.

Claim—The combination and arrangement of the curved blade with its projecting end, and the guard or stock, as specified.

53. Windlass for Moving Cars and Locomotives when without Steam; Charles Page, West Meriden, Conn.

Claim—The combination of the windlass with the jaws and the levers, when arranged, and made to produce the result, by the means and in the manner described.

54. Tools for Manufacturing Goods of Caoutchouc; D D. Parmelee, City of New York.

Claim—The instrument or tool for cutting sheets of india rubber, or its equivalent, constructed substantially as described, consisting essentially of two jaws provided with cutting edges shaped according to the form

intended to be produced, when one jaw is to operate within the other so as to effect shear action, for cutting forms at one stroke and leaving edges thereon, which are capable of being united in a more perfect and expeditious manner than has ever been done heretofore.

55. HAY RAKES; M. Raezer, Reading, Pennsylvania.

Claim—The spring bar, the foot lever, and the gearing, arranged as described.

56. WATER INDICATOR FOR STEAM BOILERS; M. Robbins and J. L. Frisbie, Cincinnati, Ohio.

Claim—1st, In the described combination with a customary steam alarm, the steam pipe, provided with a central screw, stem, and swivel, supporting the fulcrum of the float arm, in the manner set forth. 2d, In this connexion, we claim the small steam dome inclosing the branched pipe, valve, and lifter, substantially as set forth.

57. MACHINES FOR CUTTING ROOT GRAFTS; S. S. Rockwell, Vermontville, Michigan.

Claim—The arrangement of the shanks, and blades, and movable blades, in the manner specified.

58. CARPET SWEEPER; Stephen P. Rowell, Reading, Massachusetts.

Claim—In combination with the brush and its main operating gear, devices for adjusting the brush and maintaining its axis at the same or at its proper distance from the axis of the gear, in order to maintain the gear in engagement with its pinion, as specified. Also, the application of the rear dust receptacle to the frame, so as to be capable of being swung or turned upward and outward therefrom, for the discharge of dust.

59. COOKING BOILERS FOR RANGES AND STOVES; Joseph Schmadel, Dayton, Ohio.

Claim—A cooking boiler, provided with perpendicular tubes or flues around its sides, from the bottom upward, and opening into a horizontal flue or chamber around the top of the boiler, for the blaze and smoke to pass through.

60. TICKET HOLDERS; Ira W. Shaler, City of New York.

Claim—The combined construction and arrangement of the body, holding bar, spring, and catch, substantially as set forth.

61. WRAPPERS FOR CIGARS; James S. Suter and George M. Palmer, Baltimore, Maryland.

Claim—Taking pearl ash, powdered sal ammoniac, lobelia or Indian tobacco, oil of anio seed, oil of caraway, alcohol, grass, rope, rum, cascarilla bark, opium, sumac, and stems or refuse tobacco, and converting it into sheets for wrapping woolen goods to prevent moths from eating them, lining for cases for the same, covering for carpets, and wrappers for cigars or tobacco.

62. APPARATUS FOR TANNING; A. C. Taggart and Alexander Gray, Alleghany, Pennsylvania.

Claim—1st, The arrangement of pivot, y, and links, x, as herein described. 2d, The use of the pipes, n, when placed near the top of the vats, and used in connexion with the pipe, o, as described.

63. MANUFACTURE OF CANDLES; Joel H. Tatum, City of New York.

Claim—Coating or covering candles manufactured of tallow or other inferior substance, with a plurality of compositions formed of stearic acid and tallow in varying proportions, together with proper fluxes to give different degrees of fusibility, and also certain degrees of hardness and smoothness to the same, substantially as described, the candles being dipped into the several compositions in the order of the sequences.

64. LINING FOR COAL STOVES AND FURNACES; Wm. B. Treadwell, Albany, New York.

Claim—The employment of hollow blocks of metal, filled in with siliceous sand, as a new article of manufacture, to be used as a substitute in the place of fire-brick for the lining of the fire chambers of stoves and furnaces, substantially as set forth.

65. MACHINE FOR NUMBERING THE PAGES OF BOOKS; Edward and Calvin E. Town, Jersey City, New Jersey.

Claim—The use of type blocks containing a limited number of types, constructed as described, with the ratchet teeth at the side, or any equivalent device to secure their uniform motion. Also, the level bed pieces, as described, in combination with type blocks. Also, the mode of delivery of the type blocks, by means of the discharge boxes, as described. Also, the general combination of these parts with each other, and with the other parts of the machine.

66. SLIDES FOR SKIRT HOOPS; Wm. M. Warren, City of New York.

Claim—The slide composed of the two parts, formed as specified, and combined by a lock between the lapping portions of the hoop.

67. MACHINE FOR TRIMMING THE EDGES OF PAPER HANGINGS; John Waugh, Elmira, New York.

Claim—Rotating, concave, self-sharpening circular knives, whose shafts do not revolve in the same line, but at an angle to each other, giving the knives a pressure against each other, at the point of contact only—the reverse sliding motion of hopper and reel spindle, in combination with wooden roller, pulleys, and band and hand crank, in the manner set forth.

68. APPARATUS FOR MANUFACTURING FATTY ACIDS; M. Werk, Cincinnati, Ohio.

Claim—The combination of boiler superheating furnace and tank, for the production of fat acids, without distillation or direct application of fire, as set forth.

69. FURNACES FOR HEATING BUILDINGS; John Plant, Assignor to self and George H. Plant, Washington City, D. C.

Claim—The mixing of all the heated products of combustion both below and above the fire cylinder, by an arrangement of diving and ascending flues leading into common chambers, where they cross each other, and are forced to commingle, substantially as described.

70. COTTON GINS; A. Q. Withers, Byhalia, Mississippi.

Claim—The curved spring board situated in the "roll box," and provided with teeth projecting from its lower edge, arranged as specified. Also, the employment of the additional brush and carding saws, situated between the ginning saws and discharging brush, and acting in combination therewith substantially as described. In combination with the additional brush and carding saws, I claim the concentric screen and "break currents," when arranged in close proximity to said brush and saws, and for the special purposes set forth, in connexion with their action.

71. ROACH TRAP; Alexander N. Shell, Assignor to Wm. S. Wood and Thomas N. Shell, Richmond, Virginia.

Claim—The centre bait pan, in combination with the annular ring, when located as shown.

72. HAY RAKES; George Whitcomb, Port Chester, New York.

Claim—The arrangement of the treadles, lever, rake head, arms, bar, joints, and adjustable rope, substantially as set forth.

73. Seed Drills; W. Irvin Willitts, Milton, Indiana.

Claim—The arrangement and combination of the corrugated roller, the adjustable frame, receding drill ploughs, the supporting chains, and the hooks, all arranged as described.

74. Machine for Stamping Trade Marks on Cloth, &c.; Algernon S. Wright, Lawrence, Massachusetts.

Claim—The arrangement and combination of the reciprocating carriage or table, the stamping mechanism, the inking apron, and its vat or trough, as made to operate together substantially in manner as described. Also, the combination of the stamp connexion bar and the spring, as applied to the lifter rod and the stamps. Also, the peculiar means or combination for operating the stamps, viz: a mechanism for lowering them gradually toward the apron, a mechanism for allowing the stamp to fall by the force of gravity upon or toward the table, mechanism for elevating the stamp off the table as well as off the apron, as described, and mechanism for maintaining the stamp at rest during each movement of the bed or carriage, the whole being in one cam as applied to a lifter bar, as described.

75. Ice Pitcher; James H. Stimpson, Baltimore, Maryland, executor of James Stimpson, deceased, late of said Baltimore, Maryland.

Claim—The treble wall for ice pitchers, as set forth.

76. Machine for Crozing, Chamfering, and Beveling Barrels; Wm. M Arnall, Assignor to self, O. P. Smith, and A. C. Jordan, Sperryville, Virginia.

Claim—Not the employment of several tools, but the arrangement of the adjustable croze and howel blade, with the stationary beveling blade and chamfering tool, when the same are constructed and operated in the manner specified.

77. Construction of Aquaria; John Chilcott and James Scrimgeour, Assignors to selves and George F. Taylor, Brooklyn, New York.

Claim—The combination of the dovetailed tenons or tongues, and acute angular plate sliding over the same, with the outer triangular plate and ends of the plates of glass for forming a space or well between the same for the reception of the cement, and thus enabling a perfect water-tight joint to be formed at the corner of aquarea and other vessels.

78. Machine for Planing Wood; C. B. Cottrell, Assignor to self and Nathan Babcock, Westerly, R. I.

Claim—The rotating cutters and central stationary gauge, in connexion with an adjustable gauge, or its equivalent, arranged to operate as set forth.

79. Artificial Leather; Wm. K. Hall, West Hoboken, New Jersey, Assignor to Amos Broadnax, St. Louis, Missouri.

Claim—The combination of the chemical constituents of leather, or their equivalents, substantially as described, for the purpose of forming a substitute for leather.

80. Sewing Machines; Joseph E. Hendrick, Assignor to self, W. H. Nettleton, and George Stevens, Bristol, Connecticut.

Claim—The shears, handles, or bowls, in combination with the upper part or blade acting as a needle carrier, and the lower part formed as a bed, whereby the sewing and feeding mechanism is actuated by a motion of the hand similar to that of cutting with shears, as set forth.

81. Rollers for Calico Printing; John Hope, Assignor to self and Thomas Hope, Providence, R. I.

Claim—The copper shell, cast metal foundation tube, and with a mandrel connexion cast in the metallic shell or tube, and on an arbor or mandrel, in manner and of a material substantially as described.

82. Sewing Machines; Joseph White, Troy, New York.

Claim—Giving the looper its motions for catching, spreading, and holding open the loop, and then delivering it up to the needle without putting any twist in the thread, by means of a shaft having two motions at the same time, and given to it by mechanism, substantially as described.

83. Machine for Forming Barrels, &c.; Jacob Rees, Assignor to Jonah L. Rees, Elkhorn Grove, Illinois.

Claim—The construction of the cylinder, withthe radial arms, and segmental parts, and disks, the circular clamps, and guide hands, the suspension devices arranged and operated as described.

84. Railroad Car Seats; Draper Stone, Milwaukie, Assignor to self and E. S. Turner, Grafton, Wisconsin.

Claim—1st, Providing the back frame of the high back seats with hinged cushioned frames at different or the same points of elevation, and jointing the front ones of them to horizontal bars secured to the back frame, and attaching and combining therewith bracing or supporting bars and slotted bars, in which their curved ends move in such a manner as to enable the said cushioned back frames to be folded together with the back frame between them, to form comfortable and distinct reversible seats, or raised and extended to the high back seat frame next in advance to form sleeping berths or couches on different horizontal planes. 2d, The combination and arrangement of the double hinged cushioned back frames of the low back seats, with and in the relation to the double hinged cushioned bottoms, curved bar, and spring notched bars attached thereto, and horizontal ledges or ribs on the sides of the uprights of the frame, substantially in the manner set forth. 3d, Giving a greater elevation to the hinged cushioned double back and bottoms of the low back seats, by combining therewith the pins or studs on the edges of the former lugs or projections in which they rest, and rock shaft, and bars or arms attached thereto, and spring notch bars, and lugs or projections in which they rest, and rock shaft, and bars or arms attached thereto, and spring notch bars, and lugs or projections on the high back seat frame next in advance.

85. Gas Burners; Junius F. Tozer, Assignor to George W. Gregory, Binghampton, New York.

Claim—The application to the common gas burner of the two or three way turning cock, for the purpose set forth.

86. Saw-gummer; Harvey R. Wolfe, Assignor to self, David Staples, and W. H. Watson, Consolation, Ky.

Claim—The arrangement and combination of the stone, adjustable beams, screws, slots, and carriage, as set forth.

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87. Revolving Fire Arm; Thomas R. Austin, City of New York.

Claim—1st, The main spring attached to or formed on the trigger, whereby the pull on said trigger strains the main spring, as set forth. 2d, The sliding centre pin, I, shield, H, pin, H′, and toggle joints, when com-

bined with the latch for disconnecting the pin, I, as described. 3d, The double-acting spring, fitted and acting as specified, to return the sere and trigger, and parts attached to their quiescent position.

88. Hot Air Cook's Stove; Joseph M. Babcock, Albany, New York.

Claim—The combination of the double top, the perforated side plates, and the elevated oven, the same being arranged in the manner described.

89. Method of Adjusting Window Blinds; W. H. Babcock, Homer, New York.

Claim—The sliding spindle or arbor for alternately engaging the two mechanisms which severally move the slats and open the shutter, so as to operate either mechanism by the same handle.

90. Gas Burners; Yarnall Bailey, Philadelphia, Pennsylvania.

Claim—The mode of producing a flame, the extent of which may be increased or diminished at pleasure, by means of the adjustable heater, in connexion with the tube and the burner, as described.

91. Water Closet; Frederick H. Bartholomew, City of New York.

Claim—1st, The use of a drip box or leak chamber, arranged above the closet and below and around the supply cock. 2d, Arranging the supply cock upon the cover of the closet, whether the drip box be employed or not. 3d, The adjusting screw, the cam, and the lever, or the equivalent thereof. 4th, The laterally adjustable standard, substantially as described.

92. Hinge; Mathias Bettinger and August Boos, Cincinnati, Ohio.

Claim—The described arrangement and combination of the lugs and horns, for the purposes set forth.

93. Grain Drills; Samuel Binkley, Dublin, Indiana.

Claim—The slide, in the described combination with the grooved or corrugated staple, for the purposes set forth.

94. Car Couplings; George S. Bishop, Washington City, D. C.

Claim—The loop bolt or pin, B, in combination with the slots, H and L, and slide block with grooves. Also, the manner of supporting the loop bolt, by allowing the short arm to rest on the bumper head, as N, instead of resting on a block or ball, whether the slots, H and L, be separated or connected, when constructed in the manner set forth.

95. Escapement for Time-keepers; Josiah Bishop, Austin, Texas.

Claim—The combination of the lever, springs, and the detents formed on the former, arranged in the relation to the escapement wheel described, with the pallets and said escapement wheel, so as to enable the balance wheel to perform its oscillations without pressure from the motive power of the clock, or to be retarded by any other resistance except that necessary to be overcome by the vibrations of the detent lever, during the action of the pallet on the end of the spring, as set forth.

96. Machines for Dressing Stone; Wm. Cooper, Mount Gilead, Ohio.

Claim—The arrangement of the picks, screw, springs, and shaft, with the adjustable carriage, ratchet wheels, and ratchet, the same being constructed in the manner specified.

97. Cultivators; C. H. and S. E. Carrington, Weymouth, Ohio.

Claim—The arrangement and combination of the side wings and bars with each other, and in relation to the frame, in the manner specified. Also, the mode of actuating and adjusting the hoes, by means of the wheels, stirrups, bar, lever, and catch plate, arranged in combination and acting upon the handles of the hoes, substantially as set forth.

98. Machine for Peeling Willow; George J. Colby, Waterbury, Vermont.

Claim—The vibrating rollers, in combination with the rollers, comb, and apron, or its equivalent.

99. Harvesters; George E. Cooper, Baltimore, Maryland.

Claim—1st, The combination of the straining bar, finger tube, and adjusting screw, with the arms upon which the cutting blade is mounted, for the purpose of keeping the cutter, which is made thin and without stock, under constant tension. 2d, Combining the lever of the shifting clutch with the lever for raising and lowering the cutting apparatus, in the manner described, so that when it is necessary to stop the motion of the cutter, the act of depressing the lever performs the three-fold duty of raising the cutter, stopping its motion, and the motion of the raking mechanism, as described—I do not claim, however, either of these levers, separately considered, nor the functions they perform.—3d, The arrangement of the raking mechanism consisting of two hands, which open as they advance over the platform on each side of the cut grain, and close as they recede, to form the cut grain into a sheaf, and deliver it at the rear of said platform, substantially as described.

100. Machine for Sweeping Streets; Amzi Crane, Newark, New Jersey.

Claim—1st, The brush or sweeping frame, being so adjusted that when the machine is in operation, the weight of the said frame is supported, as much as may be required, at its corners, upon the springs in the posts, and is free to conform to the uneven surface of the ground either as a whole or at any of its corners. 2d, The endless band or chain of brushes, when said band or chain of brushes is operated, for the purpose of depositing the sweepings in a row, by means of the grooved rollers, or their equivalents, into which the blocks of the brushes or the links of the endless chain are made to fit. 3d, The combination together of the driving wheel, the beveled wheel, with the pulley, belt, M, rollers, Z Z, and the endless band or chain of brushes. 4th, The combination of the cross-bar with the lever, D, crank, H, levers, K and L, with their appropriate connexions, and the chains for elevating or lowering the brush frame, and throwing the machine into or out of gear, substantially in the manner described.

101. Circular Sawing Shingle Machine; Jonathan Creager, Cincinnati, Ohio.

Claim—1st, The feed rest tangential to the saw at the end toward which the saw cuts, and having a motion parallel to the plane of the saw. 2d, In this connexion the feed rolls and their accessories, constructed to elevate the feed rest by power under control of the operator. 3d, The use in this connexion of the elastic fingers, as set forth.

102. Sewing Machines; Chauncey O. Crosby, New Haven, Connecticut,

Claim—1st, The combination of the cloth holder with the needle bar and thimble bar, when constructed as described. 2d, The combination of a needle bar and thimble bar with a common needle, when made to operate as described. 3d, The combination of the feeding apparatus with the needle-bar, for carrying the needle, when made to operate as described. 4th, The combination of the needle bar with the hooks and endless tapes, when arranged substantially as described.

103. Grinding and Polishing Knives; James Dodge, Waterford, New York.

Claim—The method of grinding and polishing articles, and forming their surfaces upon a revolving grindstone or polishing wheel, by attaching them to a drum or cylinder, which is made to revolve in the same direction with the stone or wheel, and with velocity adjustable thereto. Further, the method of attaching and supporting upon a curved surface of the article to be ground, so as to permit it to rock thereon, thereby shaping the surface when formed either flat, concave, or convex, substantially as set forth.

104. Fastenings for Skirt Hoops; Alexander Douglas and Samuel S. Sherwood, City of New York.

Claim—The combination of the link or loop, c, with the clasp, b, having an opening in its side to receive and retain one prong of said loop, and with the hook, substantially as set forth.

105. Portable Boxes; A. Dreyspring, Montgomery, Alabama.

Claim—Constructing boxes capable of being folded and unfolded, without thereby impairing their shape or their usefulness, substantially as described.

106. Machine for Cross-Seaming Sheet Metal; Lucian Fay, Cincinnati, Ohio.

Claim—1st, In connexion with a cross-seaming tool, the gauge bar, constructed as set forth. 2d, The grooved roller, constructed as explained, and employed in connexion with a cross-seaming tool to roll up the metal as joined, and afterward discharge the roll without unwinding. 3d, The adjustable guides, in combination with a seaming tool, for the purpose of insuring accuracy of work.

107. Construction of Iron Railings; Wm. S. Fuller, Millbury, Massachusetts.

Claim—The application and arrangement of ring segments or segmental connexions and their sockets, made substantially as described, to fence palings, and a connexion rod, the same being to effect advantages in the construction of metallic fences.

108. Pen-holder; Josee Johnson, City of New York.

Claim—The thimble, a, with incision, c, when formed of one piece of metal and applied to the pen stock as a pen-holder.

109. Sewing Machines; J. E. A. Gibbs, Mill Point, Virginia.

Claim—In combination with an eye-pointed needle vibrating up and down and back and forth in a plane passing through the line of feed, the spring hook, or a hook constructed so as to yield sidewise or laterally of the path of the needle, when actuated by said needle in the manner described.

110. Sewing Machines; Wm. O. Grover, Boston, Massachusetts.

Claim—1st, Driving or speeding up a sewing machine by means of a convex elastic face on one wheel or pulley, acting in combination with and by friction upon a non-elastic concave face on another wheel or pulley, combined and acting together substantially in the manner specified. 2d, Supporting and steadying a sewing machine by the combination of a tube of india rubber, or its equivalent, with an internal pin or projection, the two being fitted and acting substantially in the manner set forth.

111. Water Wheel; Wm. H. Harbaugh, Piquia, Ohio.

Claim—1st, The peculiar arrangement of the bucket, in combination with the projecting annular float. 2d, The peculiar form of the bucket with reference to the percussion plate, all arranged in the manner set forth.

112. Self-closing Door; J. C. Harkness, Washington City, D. C.

Claim—The ball projecting through the socket in the bridle, and falling into a socket in the plate in the sill, in combination with the weight, cord, and pulleys, the whole arranged substantially in the manner set forth.

113. Tanning; B. Harrington and N. Russell, China, Maine.

Claim—The use of comptonia aspenifolia or sweet fern in room of bark, or any other tanning material now in use.

114. Centrifugal Pumps; Wm. C. Hibbard, West Roxbury, Massachusetts.

Claim—1st, In the construction of the fan-wheel, the combination of the curved guide plate with the vanes, arranged around a central open space, substantially as described, and working in connexion with the covers and casing, or such other equivalent devices as will co-operate with it upon the same principle. 2d, I do not claim the spiral passage of discharge constantly enlarging toward its exit, to receive the accumulated discharge from the fan-wheel, as that has before been used—but, in combination with the centrifugal pump, I claim the expanding outlet constructed upon the principle described, whether employed in combination with the spiral passage of discharge or applied directly to the fan-wheel. 3d, Constructing the casing of a centrifugal pump with a detached cover, in combination with the fan-wheel and fixed casing, as described.

115. Water Wheel; J. P. and D. W. Hoyt, Lumber City, Pennsylvania.

Claim—The combination of a wheel, as constructed, with the casing, as constructed, when the two are so arranged that the water will be received on the broad backs of the buckets, and be discharged by their inclined fronts between the casing and the shaft of the wheel, in the manner specified.

116. Index or Book-marker; Josee Johnson, City of New York.

Claim—The clasp, made of one piece of metal, with the angle between its points for receiving the leaf, while the clasp is applied in a vertical position, or nearly so, and opening to receive the leaf as it is pressed against its edge, and firmly grasping the leaf when applied.

117. Tool for Chamfering Soles for Boots and Shoes; Wm. Johnson, Hampstead, New Hampshire.

Claim—The tool, as constructed, with means not only of adjusting the angular position of the knife with respect to the sole rest, but the distance of the said edge at the gauge from the rest, as described.

118. Apparatus for Preserving Malt Liquors; John Keane, City of New York.

Claim—The diaphragm or bag of india rubber, or other similar flexible material, of a form to fit simply to half of the cask or other vessel, and attached all round the middle of the same, so as to operate in the manner described.

119. Truss Pads; L. B. McLain, Sr., New Lisbon, Ohio.

Claim—Constructing pads for trusses for hernia or rupture of solid blocks of half cones with plane and curved faces, as set forth.

120. Stirrups; John Loudon and H. Iverson, City of New York.

Claim—Constructing a stirrup with a joint at or near the centre of the sides, substantially as specified.

121. Box for Carriage Wheels; R. W. McClelland, Pekin, Illinois.

Claim—In combination, a hub box with an interior groove and flanch, as represented, the peculiar manner of constructing and placing upon the spindle the spindle boxes or bearings, so as to properly fit into the above described hub boxes.

122. Constructing Frames for Wire Cloth Paper-making Cylinders; J. and R. McMurray, City of N. Y.

Claim—The spiral wire or rod and longitudinal rods, connected to suitable heads provided with journals in connexion with the spiral wire, the whole being arranged as set forth.

123. Knitting Machines; J. K. and E. E. Kilbourn, Norfolk, Connecticut.

Claim—The transferring of stitches in a knitting machine from the needles on which they have been formed to other needles, by means of transferring hooks, or their equivalents, which take the stitches from the needles, move along to other needles and deliver the stitches to these other needles, operating automatically. Also, arranging transferring hooks with reference to the needles, in such manner that they may enter the stitches upon the needles by moving along the stems of the needles toward their heads. Also, directing the operation of transferring hooks, or their equivalents, for transferring stitches by means of a pattern barrel, or its equivalent, operating as set forth. Also, combining the mechanism that actuates transferring prongs with the mechanism that moves the needles of a knitting machine, in such manner that the prongs enter the stitches upon the needles at times when the latter are supported both vertically and laterally. Also, combining a nosing having V-shaped grooves with transferring prongs having corresponding grooves, the grooves of the nosing and prongs acting in concert to confine the needles and direct their heads into the stitches on the transferring prongs. Also, controlling the operation of the mechanism by means of which the relation of the thread guide to the needles is changed, so that yarn is supplied to more or less needles by means of a pattern barrel, or its equivalent. Also, varying the extent of travel of the needle carriage in proportion to the number of needles at work, by means of mechanism operating automatically. Also, varying the periods of time at which the mechanism begins to operate in proportion to the number of needles at work, by means of mechanism operating automatically. Also, combining the widening mechanism with the mechanism that actuates the needle carriage, in such manner that the period of time at which the former operates is varied in proportion to the number of needles at work. Also, combining the mechanism that actuates the pattern barrel, or its equivalent, with the mechanism that actuates the needle carriage, in such manner that the period of time at which the former is moved is varied in proportion to the number of needles at work. Also, combining the widening mechanism and the narrowing mechanism together, when both are used in the same machine, in such manner that the movement of the one to do its work is attended by a corresponding movement of the other, so that the thread guide and transferring hook, or their equivalents, are both in the proper position to operate in connexion with the selvage needle. Also, raising the sinkers out of the way of the prongs of the transferring instrument, substantially as set forth, so that the latter may move along the series of needles without obstruction from the sinkers. Also, obtaining a pause in the endwise movement of a nut moved by a screw, by causing the screw to move endwise while it is turning in the nut. Also, the arrangement of the pattern holes by a pattern barrel in a helical line, so that they may be brought in succession beneath the device upon which the pattern pins operate by a screw, or its equivalent. Also, operating the transferring instrument, substantially as set forth, in such manner that its movement is effected partly while the carriage is traveling in one direction, and partly while it is traveling in the opposite direction. Also, combining with a traveling series of needles and a rigid bar above them, stationary under supports over which the needles ride, so that their barbs may be closed by pressure against the stationary bar above them.

124. Gas Regulators; Wm. Mallerd, Bridgeport, Connecticut.

Claim—Arranging the graduating lever, 4, with the adjustable weight, 17, in combination with the reservoir, 2, and the valve, 10, in such a manner that by raising the reservoir the valve is closed and the supply of gas stopped, so that the pressure of the reservoir can be regulated by adjusting the weight, 17. And in combination with the lever and reservoir, I claim admitting the gas to the reservoir by means of a small tube, 8, which is contracted toward its upper end, so that impurities carried up by the gas are deposited outside of said tube without being able to interfere with the working parts of the gas regulator. And, further, arranging the stud, 21, in combination with the lever, 4, rod, 9, and valve, 10, in such a manner that by depressing the stud, 21, the supply of gas may be ascertained without raising the cover of the regulator.

125. Cultivators; T. M. Lee, Broad Ford, Virginia.

Claim—So combining the cylinder, R, stock, H, and block, O, with their respective teeth, with each other, and with the main frame, as that they can individually or severally be adjusted for deeper or shallower work.

126. Machine for Chamfering and Crozing Barrels; J. H. Mattison, Scriba, New York.

Claim—A crozing tool provided with two spurs, one before the other, to cut the sides of the croze or score, and a hook or grooving tool to cut the bottom of the score, when the whole is made or formed of a single piece of metal, substantially as described. Also, the use of the solid shaft and hollow shaft, in combination with the pulleys, or their equivalents, which operate them with different velocities, when used for the purpose of giving motion to the chamfering and crozing tools, or their equivalents, and for moving or carrying them (the chamfering and crozing tools) forward to perform their work in chamfering and crozing barrels, in the way and manner described.

127. Paper Clamps; Arnold Palmer, Lee, Massachusetts.

Claim—The pressure box placed over the bed and attached to the lever through the medium of the bar, lever, and adjusting rods, actuated by the nut or tube, f, the above parts being arranged to operate as shown, and with or without the spring catch.

128. Portable Water-proof Friction Match Safe; Platt Merrill, Sanilac, Michigan.

Claim—The lever, B, provided with the spring or yielding slide, C, the plate, F, having the spring, G, and guides, r r, for retaining the matches in place, and the arm, E, provided with the corrugated spring catch, p, the whole being arranged within and connected to the case, A, substantially as set forth.

129. Machines for Separating the Fibre from the Pulp in Hemp Leaves; S. S. Mills, Charleston, S. C.

Claim—1st, The toothed cylinder, H, concave, C, provided with the steam or water pipe, S, and reciprocating bar, D, provided with the clamp, E, arranged for shredding the hemp. 2d, The vibrating toothed plates, Q Q, in combination with the reciprocating clamp bar, L, and steam or water pipes, R R, for the purpose of heckling the hemp. 3d, The cylinder, H, provided with the longitudinal plates, e, and the concave, I, provided with the loaded plates or flaps, J, for the purpose of skutching the hemp or separating the pulp from the fibre. 4th, The combination of the tooth cylinder, B, concave, C, toothed plates, Q Q, clamp bars, D L, cylinder, H, and concave, I, provided respectively with the plates, e J, substantially as specified.

130. Manufacture of Sheet Iron; David A. Morris, Pittsburgh, Pennsylvania.

Claim—The manufacture of enameled anti-corrosive sheet iron by the process specified.

131. Compound Shell for Ordnance; L. B. Olmsted, Binghampton, New York.

Claim—Surrounding an explosive shell with a number of chambered segments, each charged with cartridges or other projectiles, and discharged by fuses properly connected with the inner exploding shell, the whole forming a second or outer spherical shell, arranged in the manner set forth.

132. Manufacture of Fire Bricks; J. Ostrander and J. S. Heartt, Troy, New York.

Claim—The manufacturing of fire bricks, tiles, or blocks of a composition consisting essentially of pulverized steatite or soapstone raw fire-clay (with or without kaolin), and a fire sand ground "biscuit," or both, the ingredients being mixed in the ratio specified, or in any other available proportions, as set forth.

133. Life Preserver; Hiram Palmer, Augusta, Michigan.

Claim—The arrangement of the folding frame, the metal chambers, B B, the provision chamber within said chambers, B B, the flexible air chambers, and the propeller, the whole being combined in the manner specified.

134. Mowing Machines; Fisk Russell, South Boston, Massachusetts.

Claim—Attaching the cutters to hubs or bosses which are fitted on pins in the finger bar, and provided with arms which are fitted in notches in the cutter bar, the bosses, arms, and bar, being covered by a plate, substantially as set forth.

135. Compositions used as Building Materials; N. C. Raymond, Austin, Texas.

Claim—The application of pasture-fed cow dung, either in substance or solution, together with lime, either slacked or unslacked, or other powerful alkaline substance, and charcoal, to the common clays or soils of the country, for the purpose of producing a building material, substantially as described.

136. Horse Shoe Machine; T. H. Russell, Northfield, and Amos Morrill, Strafford, Vermont.

Claim—The movable former and lateral forming rollers, arranged with the guide rollers and grooves, the vertical pressure roller and the female die, when combined as set forth. Further, the particular arrangement of the roller bar, G, to wit: having said bar provided with the rollers, i′ i′, which bear against blocks, j j, attached to the uprights, H H, and having the pin, h, pass through an oblong slot, g, in the upper part of the bar, substantially as set forth.

137. Construction of Cylinders and Pistons for Pumps and Steam Engines; Wallace Wells, City of N. Y.

Claim—The improved mode described of constructing the cylinders, pistons, and their connexions, for steam engines, and applying steam thereto, and of constructing the cylinders, pistons, and their connexions, in fire engines, pumps, and other machines using cylinders and pistons.

138. Method of Lighting Street Lamps by Electricity; Charles W. Smith, Evans, New York.

Claim—1st, The combination and arrangement of a circuit changer with different circuits of conducting wires, in which are included a number of street lamps, in such a manner that the lamps in one circuit only may be lighted simultaneously by means of the battery current. 2d, The combination of conducting wires with devices for operating by electricity such a circuit changer at a station remote from the operator. 3d, The arrangement of the magnet, the brass plate, the lever, and the pawl, substantially as described.

139. Rotary Planing Cutter; John Sperry, City of New York.

Claim—1st, A plane formed of a series of thin plates, said plates being in form of a cima-reversa, or other form approximating thereto, and placed side by side one another on a revolving axis or shaft, and confined in place by means of a screw nut. 2d, Having the central portion of the several sections of the plane at back and front, run at right angles to the axis of the plane, substantially as set forth.

140. Mode of Reversing the Chisel in Mortising Machines; Frederick Stamm, Lancaster, Pennsylvania.

Claim—The arrangement and combination of the devices, substantially as described, for the purpose of reversing the chisel whilst in operation.

141. Rule for Describing Polygonal Forms; Merriwether J. Thompson, St. Joseph, Missouri.

Claim—The construction, use, and application of a mitre bevel gauge formed with an arc of a circle, whereon are described various given tabular numbers, so as to indicate by fixed lines, angles, or dots, any required mitre line indicating its respective polygonal shape and measurement (without describing and subdividing a circumference), but through means of corresponding tabular numbers, substantially in the manner set forth.

142. Farm Gate; Joseph A. Treat, Talmadge, Ohio.

Claim—The levers, G H, in combination with the lever, E, and link, e, said parts being applied to the gate, arranged and connected by the chains, substantially as described.

143. Manufacture of Sugar; J. C. Tucker and L. Lanzweert, San Francisco, California.

Claim—The process of decolorizing and defecating saccharine liquid and vegetable juices, and application in the manner described of hydrated alumina—cream of alumina—prepared as set forth.

144. Cultivators; W. Tucker, Blackstone, Massachusetts.

Claim—The combination of the rotary toothed drum, of rotary series of teeth, with a set of stationary gird bars and teeth projecting therefrom, the whole being arranged, applied to a frame, and constituting a new or improved cultivator or agricultural implement, to operate substantially in the manner specified.

145. Steam Generator; Ferdinand C. Warlick, Kentish Town, England; patented in England, March 9th, 1858.

Claim—The arrangement of the water heating coil of pipes, within flues leading from the fire-place, and through or about the steam generator, when such water heating pipes terminate in foraminous pipes extending into the steam generator, so as to discharge the heated water into it in fine jets, or spray, or mist, as described. And, in combination with the coil containing the flue within the generator, and the flues about the ends, and cylindrical outer surface of the generator, I claim the flue space directly beneath the coil flue, and arranged within the generator, as described. Also, the arrangement of the side flues, the two bottom flues, and single top flue of the generator, in combination with the arrangement of the water heating pipes extending through the same, and with the coil flue and fire-place, as represented.

146. Seeding Machines; Andrew Simmons, Nora, Illinois.

Claim—Forming the seed slide of a corrugated plate, and making the seed openings therein at the edges and on opposite sides of the ridges or corrugations, substantially as set forth.

147. Elastic Stair Pad; Thomas J. Mayall, Roxbury, Assignor to self and Benj. F. Cooke, Boston, Mass.

Claim—The above described "Elastic Stair Pad," of the composition and form substantially as set forth.

148. WATER WHEEL AND CHUTE; Alden Whitman, Auburn, Maine.

Claim—The peculiar form of the bucket in conjunction with the corresponding form and relative position of the spout thereto, in the manner described.

149. HARVESTERS; John Woody, Mount Vernon, Indiana.

Claim—1st, Placing the reel between arms which have their back ends pivoted to the machine, and their front ends connected with the eccentrics on the shaft, by means of the yokes, as set forth. 2d, The roller attached to the upper part of the wing or divider, as set forth.

150. LOOMS FOR WEAVING HAIR CLOTH; Samuel B. Chaffee (for self and as administrator of Samuel M. Chaffee, deceased), Providence, Rhode Island.

Claim—1st, Forming the selvage of hair cloth by means of a set of headles operating independently of the headles used in forming the rest of the cloth, as described. 2d, The method described of operating the jack staff by the combination of the cams, I I′, rods, K K′, lever, M, and rod, N, as specified.

151. RACK FOR HOLDING COMB MATCH CARDS; E. G. Byam, Boston, Mass., and B. E. Parkhurst, Brunswick, Maine, Assignors to Ezekiel Byam, Charlestown, and S. A. Carlton and E. G. Byam, Boston, Mass.

Claim—The arrangement and combination of the frame, bars, spring, and screws, as described.

152. COTTON GINS; Lewis S. Chichester, Assignor to Henry G. Evans, City of New York.

Claim—The saws, in combination with the oscillating breast, the parts being constructed as set forth.

153. CANS FOR PRESERVING PAINTS; Edward Clark, Assignor to Wm H. Dolson, City of New York.

Claim—Attaching and securing the heads to the sheet metal body of the can or keg, by forming a projection round the interior near each end of such body, in the manner described, for the heads to rest against, and turning the edges of the body over the heads after the insertion of the latter, substantially as set forth.

154. COATING METAL; Selah Hiler, Haverstraw, New York, Assignor to John M. and Cornelius A. Berrian, City of New York.

Claim—The coating iron or steel with copper, silver, or brass alloys, where silver or copper is used, by bringing the iron or steel, while in a melted state, into contact with the coating metal, and allowing them to so remain until the two metals have become hard by cooling, substantially as specified.

155. SPELLING BLOCK; Samuel L. Hill, Assignor to Albert Palmer and Sidney Doane, City of New York.

Claim—1st, The arrangement of letters on any number of six-sided blocks, in the manner described. 2d, Giving to and placing upon each block its proper numerical figure, for the purpose specified.

156. CORN ERADICATORS; Corydon Wheat, Geneva, New York.

Claim—The corn eradicator, constructed as described, as an article of manufacture.

157. HARVESTERS; John K. Harris, Allensville, Indiana.

Claim—The rocking pinion with cogs, p and p′, adapted to yield, as explained, when passing the ends of the wheel cogs, or on the backward motion of the drive wheel.

158. SEWING MACHINES; Warren Millar, Assignor to self and John Nutt, Chicago, Illinois.

Claim—1st, The revolving hooked ring, constructed as described, when arranged and operating in combination with the needle and the reciprocating spool, carrying the locking thread, for the purpose specified. 2d, The loose ring applied within the rotating two hooked ring, and operating in combination therewith, substantially as described, to produce a tension on the locking thread.

159. PUMPS; Henry W. Regan, Cressona, Assignor to self and George H. Newer, Harrisburg, Pennsylvania.

Claim—Combining with the water ways of a double-acting pump and air chambers divided by a partition, so that each of the water ways shall have its own air chamber, but the water from each to be transmitted into a common chamber before its exit from the pump, substantiailly as set forth.

160. BREECH LOADING FIRE ARM; John P. Schenkl, Worcester, Assignor to self and Edward A. Dana, Boston, Massachusetts.

Claim—In combination with the bore or chamber of a fire arm or piece of ordnance, a secondary and smaller fire arm or barrel arranged within it, substantially as described. I do not claim a conical tige, as used in the "carabine a tige," and for the purpose of spreading a ball. But I claim the conical or tapering spreader or end of the tige, in connexion or combination with the chamber within the tige, and to operate in the manner as specified. Also, the improvement of the chambered tige or secondary barrel, as made with a cutting front end, and particularly as made with a serrated end. Also, the arrangement of the touch-hole of the hollow tige in the breech screw thereof, in such manner that when the breech screw is in place in the main barrel, not only shall its touch-hole communicate with that of the main barrel, but the breech screw shall intercept all communication of the touch-hole of the main barrel with the bore or chamber of such main barrel, except through the touch-hole and bore of the secondary barrel. Also, the improved combination of tige that is with the base of the spreader, made of greater diameter than the neck or part of the tige which is immediately below it, the same being for the purpose as set forth.

161. SPADING MACHINES; Judd Stevens, Assignor to self and John L. Beadle, Marengo, New York.

Claim—Jointing or hanging the spade to the wheel, in such a manner that in the forward motion of the machine, it will remain in proximity with the periphery of the wheel until the lifting of the earth commences, when it shall pass outwards or slide upon its bearing, thereby acting more efficiently to raise and disintegrate the soil. Also, the combination and arrangement of the tripping lever with the spade, substantially as described.

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162. EXTRACTION OF VOLATILE OILS, &c., FROM COAL; Luther Atwood, Brooklyn, New York.

Claim—1st, The gradual and progressive formation at a comparatively low temperature of oleaginous vapors and oil from coal, or other substances yielding pyrogenic oils, by the gradual and progressive action of the heat of products of combustion upon and through the mass. 2d, The immediate removal of the oleaginous vapors and volatile products of decomposition from the point of formation away from further action of the heat conducing to, and resulting from, their production, through the remainder of the mass and apparatus, by means of a properly regulated current of products of combustion. 3d, Condensing the liquid volatile products of distillation within the body of the distilling tower, and during the continuous distillation of the solid materials, substantially as described. 4th, Obtaining crude oil from coal, and other solid substances yielding pyrogenic oils, by the combined and successive operation of the above mentioned methods of treatment.

163. Skeleton Skirts; E. G. Atwood, Derby, Connecticut.

Claim—A skirt formed of tape, or other similar material, and a series of circle hoops, when the tape is passed over one hoop and under the next below it, in opposing oblique directions, and the tapes fastened at the points where they interlock on the hoops themselves, by clasping, sewing, or tying, substantially as set forth.

164. Seeding Machines; A. G. Babcock, Galesburgh, Illinois.

Claim—The described arrangement of the form rollers, grooved cylinder, elastic wipers, hopper, guide plate, drags, and windlass, when constructed as set forth.

165. Coffee Pots; Nelson Barlow, City of New York.

Claim—The tubular condensing vessel in its specified arrangement, when cold water is used in the same, and the discharge is graduated in the manner described.

166. Gauge for Contents of Casks, &c.; John K. Barney, Warren, Rhode Island.

Claim—The double rods with arms, tubes, and index, as described, and their combination in the instrument, by which the cask is measured in length and diameter outside or inside, in manner set forth, and the construction of the tables with slides, by which is found by inspection the mean diameter, the proper allowance for thickness of staves or head, and the quantity of contents of the cask, from the given or ascertained admeasurement.

167. Composition for Paints; James K. Beardsley, City of New York.

Claim—The composition of matter to be used alone as a white paint, or in admixture with pigments for colored paints, as set forth.

168. Mode of Opening and Closing Farm Gates; Wm. T. Boggs, Cincinnati, Ohio.

Claim—The grooved cylinder or cam actuated by the loaded pawl arm, and used in connexion with the lever and arm. Also, in combination with the cylinder or cam, pawl arm, lever, and arm, the drop latch, arranged with the levers, k, l, so that the latch may be operated automatically, as described.

169. Manufacture of Wrought Nails; Otis Breden, St. Louis, Missouri.

Claim—1st, The die faces, constructed and fitted as described, operated in connexion with the slides, the crank, and the cams. 2d, The use of the bar for moving out the arm and the spring, for forcing in the chisel which is attached to the arm, to cut off the nail. 3d, The attachment of the rod to the crank working the feed gearing, causing the rollers to revolve and feed the iron from the furnace into the die faces. 4th, The employment of the header wheel and the operation of the rods attached to the crank, for moving the same around in order to bring the nail opposite the header die. 5th, The employment of the header die with the slide, for the purpose of forming the head, together with the pawl for holding up the slide, and the motion of the cam in lifting the trigger of the pawl, leaving the slide free to be forced in to head the nail by the spring.

170. Posts fof Clothes Lines; Benjamin Chesnut, Philadelphia, Pennsylvania.

Claim—The post with its row of inclined teeth, and its roller and pawl, and the brackets with their rollers, when the several parts are combined as set forth.

171. Arrangement of Means for Making Tight Joints around the Faucets of Water Coolers; John S. Clark, Philadelphia, Pennsylvania.

Claim—The projection, ring, and cap, as an arrangement of means for allowing of the making of a perfect joint, as described.

172. Cut-off Valves for Steam Engines; Benjamin Bunce, City of New York.

Claim—Combining with a slide valve of ordinary character, a cut-off valve, constructed substantially as described, that is to say, the slotted tube, secured in a fixed position upon the slide, said tube having its ends so closed that the steam shall pass to the valve through the slots, and having also upon it a cylinder slotted in like manner capable of being revolved thereon, so that the opening and closing of the slotted passages shall be effected by the action of the slide valve itself in carrying the cut-off to and from the stops set to intercept the revolving cylinder, as set forth.

173. Liquid Gauge; Erastus T. Bussell and Joseph Smith, Cincinnati, Ohio.

Claim—The double spring valve composed of valves, springs, and rod, or their equivalents, combined with a measuring faucet, as described.

174. Carpet Sweeper; Augustus C. Carey, Ipswich, Massachusetts.

Claim—1st, Placing the revolving brush at the extreme front of the box, and hanging it in adjustable bearings. 2d, The deflector, operating substantially as described. 3d, The combination of the revolving brush, the double pulley, or its equivalent, and the roll, when so arranged that the brush may be disconnected from the roll and be operated by hand, substantially in the manner specified.

175. Lubricator; Elias Clampitt, Baltimore, Maryland.

Claim—The peculiar construction of my valve and the introduction of hollow tube into stem (in connexion with valve), with its openings and flanch below, acting as a valve against the lower end of shaft, supplied with a spiral spring at top, producing thereby a self-acting valve, when the pressure on cup is removed, as described.

176. Manufacture of Sheet Iron; Josephus Chandler, Attica, Ohio.

Claim—Coating or covering bars, plates, or sheets of iron, or either of them, before, at, or during the manufacturing process of heating and rolling with clay, iron ore, or other mineral matter, salts, and also with the chlorides or other compounds of zinc, tin, &c., or of their mixtures with other mineral matter, for the purpose substantially as set forth.

177. Hammers; Josiah P. Clark, Portland, Maine.

Claim—The combination with an ordinary hammer of the metallic plate with an opening and slide, constructed substantially as set forth.

178. Horse Collars; C. K. Cuckler, Columbus, Ohio.

Claim—The combination of the breast plate, E, springs, D D, side plates, a a, and springs, c c, when the whole are arranged in the manner specified.

179. Machines for Lifting Heavy Weights; T. J. Davis, Scroepell, and J. B. Warner, Volney, New York.

Claim—The combination of lever, D, operating horizontally, and lever, C, moving parallel to each other

in a line with the fulcrum, and catching alternately into ratchet, B, as they are made to reciprocate by the vibrations of lever, D, as described.

180. Hammer Heads; Rufus Dawes, Washington City, D. C.

Claim—A hammer head, with its face inclined to the longitudinal axis of the head, in the manner set forth.

181. Ploughs; John Dickson, New Castle, Pennsylvania.

Claim—The use of a double movable landside for increasing the size and weight of the plough, in the manner described.

182. Marine Propeller; John Eaton, Belleville, Canada.

Claim—Propelling boats by means of paddles or vanes rotating in, and surrounded by, a casting provided with an aperture or apertures near the centre to receive the water, and with a radial spout for the discharge, when such rotating vanes or paddles and surrounding case are placed at the stern, and outside the boat or vessel, substantially as described. Also, making said case which surrounds the paddles or vanes so that it can be turned to place the discharge spout in any desired direction relatively to the plane of the keel, for the purpose of propelling the boat or vessel either forward or backward without reversing the direction of the propeller, and also for steering or turning, as set forth.

183. Paddle Wheel; H. Ehrhart, Muscatine, Iowa.

Claim—The described system of lever-like arms, carrying the floats pivoted to the body of the wheel, and combined with each other by the floats and rods, and operating substantially as described, in combination with the guides.

184. Harvesters; Rosewell H. Fisher, Claremont, New Hampshire.

Claim—1st, The combination of the connecting rod, e, slide bar, c, eccentric wheel, d, rod, f, and lever, g, with the cutter, k, for the purpose of throwing said cutter bar in and out of gear. 2d, The arrangement of the plates, h, the cutters, i i i, the slotted wheels, n n n, and the cutter bar, k, with the fingers, j j, the same being conjoined and constructed in the manner described. 3d, Securing the reel, H, to the wheels, J J, when it is operated and adjusted by the means set forth.

185. Furnaces for Tempering Steel; Perry G. Gardiner, City of New York.

Claim—1st, The heating of steel for the purposes of preparation, for hardening, tempering, or annealing in a closed chamber or oven of fire-brick, or other suitable material, impervious to the flame, smoke, and gases of combustion—the smoke, flame, and gases of combustion being distributed over the exterior surface of the floor, roof, and rear of the heating oven, by means of vertical and return or reverberatory flues between the fire chamber and chimney. 2d, The perforated air tube placed at the foot of the vertical descending flues on the side of the bridge wall opposite the fire-place, in combination with the fire chamber and flues, and between the fire chamber and oven, operating in the manner set forth.

186. Photographic Shield; Ebenezer Gordon, City of New York.

Claim—The corners formed with two recesses, and applied at the angles of a square frame to receive the photographic plate, or its equivalent, in a horizontal or vertical position, as set forth.

187. Writing Table; Jacob S. Haskill, Salem, Massachusetts.

Claim—The arrangement of the circular bolt with, and for fastening of the several drawers, substantially as specified.

188. Stave Jointer; William Halderman, Freeport, Illinois.

Claim—The combination of the rotating conical cutter heads and the polygonal feed wheel, arranged for joint action substantially as set forth.

189. Apparatus for Making Glass Stoppers for Bottles, &c.; Thomas R. Martell, Philadelphia, Penna.

Claim—The block or die with its vertical recesses, in combination with the spindle, its grooved disk, and the radial punches, when the whole are arranged substantially as set forth.

190. Sewing Machines; George W. Hubbard, West Meriden, Connecticut.

Claim—Operating the looper by means of a pin working in conjunction with the needle, in the manner substantially as described.

191. Construction of Metallic Side Pavements; Peter H. Jackson, City of New York.

Claim—The combination of the tie rods and brackets formed on the under sides of the plates, with the staunchions acting to connect said plates to each other, straighten said plates, and strain the said tie rods, substantially as specified.

192. Bottles for Containing Mercury; Isaac G. Johnson, Spuyten Duyvil, New York.

Claim—The mercury bottle formed and composed of malleable cast iron, substantially in the manner set forth.

193. Water Gauges for Steam Boilers; J. Johnson and R. Lapham, City of New York.

Claim—The hollow plugs with conical stem fitting into the glass tube, and the elongated hole or passage, in combination with the screw for adjusting the plugs, operating as described.

194. Hoisting Jacks; William Kearney, Newark, New Jersey.

Claim—The combination of the screw shaft, two or more concave faced worm wheels, two or more worms of different threads, the journals of the worms in eccentrics, two nut cases or boxes with an adjustable crank, in the manner specified.

195. Re-sawing Machine; William D. Leavitt, Cincinnati, Ohio.

Claim—The combination of the yoked feed rollers and clamps extending up to or near the perimeter of the saw, for the purpose of feeding through and pressing out all the warps or bends in the board or plank, and holding them so pressed out until the same acts substantially as described. Also, the combination with the yoked feed rolls and clamps, operating together as described, the auxiliary feed rolls to receive and feed in the next succeeding board or plank without affecting the action of the other rolls on the plank or board being sawed.

196. Hoop Skirts; George Mallory, Watertown, Connecticut.

Claim—The construction of one or more of the hoops or springs of a skirt, with elastic pieces, or their equivalents, arranged one on each side so as to provide for flexure of said hoop or hoops over the edge of a

seat, when its or their back parts are sat upon, without impairing their flexibility, in an upward and downward direction of any other parts than those where the flexure is immediately required, substantially as described.

197. Maize Harvesters; C. B. Matthews, Oquawka, Illinois.

Claim—The saw and stationary cutters, in combination with the revolving arms attached to shafts, when the several parts are arranged to operate as set forth. Also, in combination with the above, the sliding bars or slats connected with the lever, and arranged with the opening in the platform, as described.

198. Bedstead; Rufus Maxwell, Tucker County, Virginia.

Claim—The construction and arrangement of the end rail with the notch, the side rail with the tenon, substantially as described.

199. Combined Mop and Brush; Henry McClay, Niles, Michigan.

Claim—The tri-lateral block or head attached at one side to the handle, and having a brush formed on one of the other sides, the remaining side being corrugated and having a cloth attached, the whole being arranged as set forth.

200. Field Fence; John B. Mitchell, Wayne, New York.

Claim—The combination of the slotted post with the panels. when constructed with the slides and auxiliary battens, so as to form a fence readily convertible from a straight to an angular one, substantially in the manner set forth.

201. Rolls for Planishing Iron; James Noble, Monongahela Borough, Pennsylvania.

Claim—The use of rolls having a straight groove, depression, or recess extending parallel to its axis for the entire length of the roll, or at least for the length of the other roll of the pair into which the other roll is placed before they are pressed together, for the purpose of securing a degree of pressure adequate to the planishing of single sheets of metal, in the manner described.

202. Coffee Roasters; C. J. C. Peterson, Davenport, Iowa.

Claim—The application of a damper, constructed and operating substantially as set forth, to the drum of a coffee roaster. Also, the spring catch and block, in connexion with the sliding door of the drum, constructed as described.

203. Ploughs; Wm. Reaney, Berzelia, Georgia.

Claim—1st, The mode of varying the form of the plough by the use of the adjustable coulters, the latter being provided with the sub-soiler, and the several parts constructed as set forth. 2d, The use of the wedge, in combination with the mould-board for adjusting the entire front part of the mould-board to correspond with the adjustment of the coulters, as described.

204. Raking Attachment to Harvesters; A. R. Reese, Phillipsburgh, New Jersey.

Claim—The combination of the vibrating arm, the rake, the link piece, and the crank, when the several parts are constructed substantially as described.

205. Clasps for Metallic or other Flexible Bands; Albert C. Richard, Newtown, Connecticut.

Claim—The use of frame, a, and ring, b, in combination with band, e, substantially as described.

206. Burglars' Alarm; H. R. Robbins, Baltimore, Maryland.

Claim—The manner specified of combining and arranging relatively to each other on a door and door frame, or other structure, the alarm movement, cap nipple, exploding spring hammer, and stop or set pin, for the purpose set forth.

207. Seeding Machines; Marshall S. Root, Medina, Ohio.

Claim—The bent arms, Q Q, arms, P and U, rod, O, and spring, R, when these several parts are arranged as described, for operating the corn planter and sower, and combined with the revolving harrow, as set forth.

208. Method of Opening and Closing Farm Gates by Approaching Vehicles; E. C Rowland, Phelps, New York.

Claim—The connexions described of the levers and the endldss chain, as connected with the gate, for the purpose of forming self-opening and shutting gates.

209. Submarine Explorer; Van Buren Ryerson, City of New York.

Claim—The method of controlling the rising and sinking power of the apparatus, by means of a reservoir or reservoirs of compressed air, connected and combined with a working chamber or chambers, and rising or sinking therewith, so that the operators within, by the use of the compressed air, can readily control the rising and sinking power of the apparatus without communication with the surface. Also, a submarine explorer, in which the rising and sinking power is controlled by a reservoir or reservoirs of compressed air, making part thereof, and rising and sinking therewith, and in which there are two or more working chambers, the dividing the said working chambers by a hatchway, which can be closed water and air-tight to sustain the apparatus with the top above water, when said top is open for any purpose, as set forth. Also, in combination with the reservoir or reservoirs of compressed air, connected and combined with one or more working chambers, and rising and sinking therewith, the employment of one or more ballast chambers at or near the bottom, and so arranged that at the will of the operators they can be made to communicate with the compressed air reservoir or reservoirs, and with the surrounding water to increase the lifting or sinking power of the apparatus, as set forth. Also, in a submarine explorer, combining with the working chamber or chambers thereof, the employment of a spray or shower of water, which at the will of the operators inside may be discharged at any time required to purify the air by absorption. Also, in combination with the reservoir or reservoirs for compressed air, combined and moving with one or more working chambers, the employment of a pump which can be worked by the operators within, and which communicates with the reservoir or reservoirs of compressed air, and also by means of a flexible pipe and float provided with a self-acting valve with the atmosphere above, so that in case of accident the operators within can replenish the air in the reservoirs to enable them to control the apparatus, as described.

210. Method of Applying Electricity during Extraction of Teeth; J. S. Simmerman, Glassborough, New Jersey.

Claim—Applying electricity to the gums or teeth, or both, during the operation of extracting teeth, by means of the insulated adjustable spring clip described, or its equivalent, the said clip being connected to one of the poles of an adjustable electro-magnetic machine, or its equivalent.

211. Harvesters; J. D. Smith, Lancaster, Ohio.

Claim—Having a horizontal joint in and near the centre of the reel frame piece, substantially as set forth.

212. Umbrellas; Henry Steele, Jersey City, New Jersey.

Claim—The combination of a lock with a closing catch of an umbrella, for the purpose specified.

213. Machine for Cutting Staves from the Bolt; Wm. Steele, Wheeling, Virginia.

Claim—1st, The use of an apron hinged to the bed plate, as described, or otherwise attached to the machine in such a manner that it can be held under or back of the knife to support the piece during the process of cutting, and then swing down or fall back to allow the piece to drop from the knife. 2d, The combination of the levers and stops, as described, or their equivalents. 3d, My improvement to be applicable to machinery for cutting steamed wood, for any or all of the purposes for which it is now (or may be) cut.

214. Cultivators; T. S. Stevens, Pepperell, Massachusetts.

Claim—The combination of a set of vertical stripping cutters and a set or series of revolving under surface cutters, applied to operate together, substantially as specified.

215. Hydrants; James Swan, Brooklyn, New York.

Claim—The use of the elastic tube, in combination with the metal or rigid tube, for the purpose of excluding water from the entire length of the hydrant, when arranged substantially as described.

216. Paper Feeder for Printing Presses; Lemuel T. Wells, Cincinnati, Ohio.

Claim—In the described connexion with the cylinder of a printing press, the vibrating frame bearing the nippers and opposing bar, and operated substantially in the manner set forth.

217. Nut Machines; S. H. Whitaker, Cincinnati, Ohio.

Claim—1st, The die-box and punch, or their equivalents, operating as set forth, so as to embody the greater portion of the wad or core in the nut or bar, while confined on all sides save one, in the act of punching. 2d, The arrangement of the punches, dies, and perforated bridge, or equivalent devices, operating together substantially in the manner described, for the automatic and economical manufacture of hot-pressed nuts.

218. Devices for Adjusting to a Right Angle the Joiner's Square; L. Yale, Jr., Philadelphia, Penna.

Claim—Extending an arm, or its equivalent, to act as a lever along the handle or stock far enough to insure the proper effect of the adjusting screws, or their equivalents, for the purpose and substantially as described.

219. Bank Locks; S. S. Burlingame, Assignor to self and Wm. Taylor, Warwick, Rhode Island.

Claim—One or more pairs of spring slides to close the key-hole, provided with pins to enter the notches and lock the collar or working key, the slides being so constructed as to be pushed open by the point and bits of the key when it is inserted as described. Also, the collar or working key, in combination with the pawls, so constructed and arranged as to be pushed out by the bits of the key, when it is inserted as described. Also, closing the key-hole and locking the working key by the sliding tube or collar, pushed out by a spring and locked in the key-hole by the bolt, as described. Also, fastening the working key to the back plate of the lock by means of a flanch and plate, substantially in the manner described.

220. Manufacturing Car Wheels of Cast Iron; G. S. Bosworth, Assignor to Anson Atwood, Troy, N. Y.

Claim—The employment of highly heated "chills," when combined with sand moulds, in the manner set forth.

221. Lathe for Cutting Screws from Wire; George W. Daniels, Assignor to self and Abraham Fuller, Waltham, Massachusetts.

Claim—Combining with a lathe arbor devices made and applied to it, substantially as described, so as to enable rods varying in diameter to be securely clamped and centered in the arbor, and to extend entirely through it, in manner as specified.

222. Chronometer Escapement; Thomas Morrison, Assignor to A. S. Solomons, City of New York.

Claim—1st, Vibrating the detent of a chronometer (or single beat) escapement by direct mechanical action. 2d, The detent lever vibrating on pivots or a staff, when operating in the manner set forth. 3d, The arrangement and operation of the pallet, in the manner specified.

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223. Tools for Manufacturing Wire Riddles; Sanford Adams, Boston, Massachusetts.

Claim—The tool for manufacturing riddles, having teeth, operating in the manner substantially as set forth.

224. Washing Machines; Wm. T. Armstrong, Sandwich, Illinois.

Claim—Making one or more inverted ribbed curves in an arched or curved rubber, substantially as described.

225. Scrubbing Machine; Samuel M. Barnett, New Orleans, Louisiana.

Claim—The tri-lateral frame provided with the soap and water boxes, arbor with brush attached, and the movable bars with brushes and sponges, either or both, or their equivalents, attached, the whole being arranged as set forth.

226. Grain-discharging Attachment to Harvesting Machines; J. F. Black, Lancaster, Illinois.

Claim—Operating the gavel discharger, that is to say, the rotating arms of shaft from the driving wheel through the medium of the wheel provided with the slot and tooth, and the pinion provided with a quadrilateral plate, as described.

227. Car Seats; A. C. Blondyn, St. Joseph, Missouri.

Claim—The combination and arrangement of the swinging frame, extending and rolling mattress, the roller, D, shaft, H, roller, H′, and cord, G, or their equivalent, for operating said mattress, and the sectors to which the seat bottoms are secured, by which a seat facing either end of the car, or a reclining or sleeping couch, capable of accommodating the two occupants of the seat, can be obtained, the whole being constructed as described.

228. Churns; James H. Bump, Morris, New York.

Claim—The arrangement and combination with the churn of a chamber through which the air that mingles with the cream is made to circulate, substantially as described.

229. Extension Splints; William Bunce, Sullivan, Ohio.

Claim—The combination and arrangement of the side pieces, forming with the band and set-screws an

adjustable splint, the foot-piece with its joint, b, and set-screw, the flexing braces, the extension bar, the windlass and cord, the perineal pad and pads, all combined and arranged as described, so as to form an extension splint, operating in the manner substantially as set forth.

230. Steam Pumping Engine; Ezra Cope, Cincinnati, Ohio.

Claim—The arrangement of steam and water passages, both in one trunnion, and guide rods, to complete an independent pumping engine. Further, arranging the escape steam passage, to separate the steam supply and water passages, to prevent condensation of the supply steam, all substantially as set forth.

231. Washing Machine; Theodore G. Eiswald, Providence, Rhode Island.

Claim—The washing of clothes by means of the arrangement, construction, and combination of the two cylinders revolving in different directions, substantially as described.

232. Cider Mills; John Eiberweiser, Cincinnati, Ohio.

Claim—The particular construction and arrangement of two cylinders, as described.

233. Brick Machines; Thomas Forbes, Kansas City, Missouri.

Claim—The arrangement and combination of the variable rods with the sockets, pinions, and spur wheel, as described.

234. Grain Separators; Aaron Foster, Quincy, Illinois.

Claim—The arrangement of the annular receptacles, in combination with the trumpet-shaped cone, and also the employment of the interior of said cone as an additional receptacle together, for the purpose of assorting the mixed grains, after separation from the wheat, according to their respective qualities, substantially as described.

235. Bedstead Bottom; Samuel E. Hartwell, City of New York.

Claim—The adjustable rack, carrying the elastic loop and connected to the slat by the clasp, substantially as specified.

236. Self-mousing Hook; John R. Henshaw, Middletown, Connecticut.

Claim—A self-mousing hook having a socket and ear, and a horizontal spring, made as described.

237. Railroad Switches; Simeon Heywood, Claremont, New Hampshire.

Claim—The arrangement and construction of the bent or curved bars, having racks attached and operated by a pinion, as described.

[In connexion with the ordinary switch rails this inventor uses a movable frog, so arranged that the switch and frog will be operated simultaneously by the movement of a single lever or shaft, and the frog, as well as the switch, moved in line with the rails over which the train is to pass. By this improvement a continuous track is formed, thereby obviating the objections to the usual stationary frog, to wit: the danger of the cars being thrown from the track, and the wear and tear of the switches, as well as the wheels and running gear generally of the cars, in passing over the switches.]

238. Pen Fountains; Josee Johnson, City of New York.

Claim—The application to the ordinary pen of a spiral spring fountain, when constructed with an adjustable band, in the manner described.

239. Machines for Making Candles; John Jones, Baltimore, Maryland.

Claim—The feeding and packing roller with blades moving alternately in and out by the cam, as shown, or by an eccentric, or any other device, for the purpose of feeding and working tallow, wax, or other plastic material. Also, the combination of one or more feeding and packing rollers with the various moulds for the different purposes to which it is applicable. Also, the entire combination of the machinery for the purpose of cutting and removing the candles, as described.

240. Cheese Press; Hartwell Kendall, East Dorset, Vermont.

Claim—Applying the power through the sliding frame, by means of the ratchet wheel, and the pawls, lever, and crank, connected therewith, or their equivalents, so that the shaft of said ratchet wheel shall act upon and move the eccentric, at the same time serving as an anti-friction roller, whereby simplicity, lightness, and compactness of construction, and greater efficiency of action are secured, as specified.

241. Chimney Caps; Bernhard Kihlholz, St. Louis, Missouri.

Claim—The chimney smoke regulator, consisting of the pipe, deflector, and cap, enclosed in cylinder, attached to cover, the whole constructed as set forth.

242. Dining and other Tables; Alexander Kinkead, Washington Co., Ohio.

Claim—The combination and arrangement of the adjustable drawer-like or chambered rotating tablet, with the hinged upwardly folding disk, when constructed as shown, and used with a dining or other table, for the purposes substantially in the manner as set forth.

243. Gasometers; George W. Kraft, Philadelphia, Pennsylvania.

Claim—The construction and application of the V-shaped cup or lute, whether as shown by the inner section, fig. 2, or by the inner and outer section, fig. 3, and this I claim whether it be accomplished precisely as described, or in any manner equivalent thereto, producing substantially the same result.

244. Flat Iron; David Lithgow, Philadelphia, Pennsylvania.

Claim—The combination of the two jet pipes and the heating plate, in the manner substantially as described.

245. Spoke Machine; Luke L. Knight and D. H. Rice, Barre, Massachusetts.

Claim—The employment or use of two carriages, in combination with expanding cutter heads, or any proper cutting tool, arranged to operate substantially as set forth. Also, the circular saw, in combination with the expanding cutter heads, when the parts are connected so as to operate conjointly, as shown, to wit: as regards their lateral and rotating movements, and used in connexion with the carriages, for the purpose specified. Further, the loaded arms, e. attached to the swivels, d, the arms being forked at their outer ends and used in connexion with the curved bars.

246. Brick Machines; John Kutts, Philadelphia, Pennsylvania.

Claim—The main cylinder, when constructed and arranged in the manner and for the purpose specified, that is to say, with the stationary hollow axis, with the beams or truss through the same, the eccentric collar, piston, with its knuckle joint and shoe and division plates. Also, the arrangement of the double chamber or box beam over the cylinder, in combination with the back horizontal pistons and cut-off slide, propelling bars,

and levers, all arranged for joint operation in the manner set forth. Also, the compound or double levers in the box over the press beam, when these are constructed and arranged in connexion with the gearing or fly-wheel, substantially in the manner set forth. Also, the double rimmed elevating and filling boxes, when constructed as specified. Also, the pulverizers, when constructed in the manner specified. Also, the fly or wing wheel for lowering the brick from one belt to another belt, at right angles thereto, when constructed as described.

247. Bridles to Prevent Horses from Kicking or Running Away; John M. Lanier, Eufaula, Alabama.

Claim—The employment of two bits, so arranged with two sets of reins that one bit will operate upon the lower jaw, while the other operates upon the roof of the mouth and upper jaw, the same being combined and operated in the manner specified.

248. Lamp Wicks; James Y. Leslie, Brooklyn, New York.

Claim—A lamp wick composed of a single yarn when double looped, as described.

249. Paddle Wheel; Richard B. Locke, Stapleton, New York.

Claim—Connecting the plates to each other or to staying rings at their adjacent angles, substantially as described.

250. Hydro-carbon Vapor Burners; Alonzo M. Mace, Springfield, Massachusetts.

Claim—The use of a heating chamber, connected with vaporizing tubes at the crown or upper part and over the flame, constructed substantially in the manner set forth.

251. Cotton Presses; Cornelius Martratt, Waterford, New York.

Claim—The application of the racks connected to the frame, in combination with the pinions and side shafts revolving freely, and connected to the sides of said follower, for the purpose of distributing the pressure equally over the surface of follower as it is raised, and obviating the tipping and end strain, and diminishing the friction, substantially as set forth.

252. Transit Instrument; Robert C. Matthewson, San Francisco, California.

Claim—The manner in which the instrument is constructed, so as to ascertain the longitude, and run a true parallel of latitude by fore and back sights.

253. Ornamental Glass; Jasper S. Miles, Ann Arbor, Michigan.

Claim—The said manufacture produced by the combination of two plates of glass with coloring matters, by a process like that specified.

[The colors, which may be zinc white, vermillion, Paris green, ultramarine blue, or others, are ground very fine, and mixed with boiled linseed oil and Damar varnish. These are then laid on two pieces of glass with a dubber or brush, and one piece of glass placed on the other, with their painted surfaces in contact. They are then worked upon one another slightly with the hand, separated, and left to dry—they are again placed in contact, and secured together, and when seen with the light shining on them, have a highly ornamental appearance. When viewed placed between the observer and the light, the coralline or foliated appearance is distinctly visible.]

254. Refrigerator; James Naughten, Cincinnati, Ohio.

Claim—The combination of the valves and rods, arranged substantially as set forth.

255. Device for Elevating Water by the Combustion of a Volatilizable Hydro-carbon; Robert Nelson, City of New York.

Claim—Elevating water by producing a vacuum with a proper receiver, by means of any hydro-carbon fluid, when so applied and arranged with suitable mechanism that the fluid will be volatilized in proper or desired quantities, and exploded by one and the same source of heat. Further, the particular means employed for volatilizing and exploding the hydro-carbon fluid, to wit: the box, M, provided with a lamp and valve, and attached to the box, G, into which the tube, J, being provided with a cock, which, as well as the valve, is operated by the movement of a slide, substantially as described.

256. Rails for Street Railroads; Samuel Nicolson, Boston, Massachusetts.

I do not claim making the railroad car wheel bearing surface of the rail with a flat or slightly curved top, having its corners rounded down to quadrantal arcs, such being the common way of forming the said rail. But I

Claim—Making the rail with the straight or slightly curved inclined surface or plane, a c, arranged with respect to the surface of the street, as shown. Also, as an improvement in the guard, making it a flat plane, arranged as shown. Also, making the inside corner of the rail angular, with reference to the upper surface of the horse tread, as shown.

257. Cooking Stoves; John Pearson, Jr., Newburyport, Massachusetts.

Claim—The combination and arrangement of the hollow back of the fire-place with the oven, the fire-place, and the flue, whereby the heat of the fire-place and the said flue is made to warm the air which passes into the hollow back, such air being subsequently discharged into the oven, as described. Also, the combination and arrangement of the smoke flues and the air flues, the whole being disposed with respect to the oven, essentially as described. Also, the air guard as arranged on the upper smoke flue, and with respect to the air register and discharge pipe thereof, substantially in manner as specified.

258. Railroad Car Coupling; Philander Perry, Troy, New York.

Claim—The combination of the horizontally and vertically moving links, with the parts which adjust said links perpendicularly, so as to suit different heights of platforms, and with the vertical lever and horizontal rod for moving the links apart horizontally, so as to disconnect the cars, and with the sliding spring boxes which allow the cars to approximate without straining the pins when the cars crowd upon one another, substantially as set forth.

259. Copying Press; Edwin and Jacob B. Platt, Clarke Co., Georgia.

Claim—The stirrup and its plates, arranged substantially as set forth. Also, the frame, in combination with its levers, so arranged with the bed plate and follower as that they can be easily separated from each other, and then packed to form a portable copying press.

260. Washing Machine; Joseph F. Pond, Cleveland Ohio.

Claim—The suspension of the rollers upon the vibrating bars at the extremities of slide rods, in combination with the spring and upper roller, the whole constructed as set forth.

261. Mode of Operating Pumps; Daniel J. Rogers, Magnolia, North Carolina.

Claim—The arrangement of the intermediate auxiliary lever, flexible frame, pistons, elevated rocking shaft, elevated weighted rod, and pendulous handle or lever, in the relation to each other shown.

262. Method of Insulating and Supporting Lightning Rods; Elkanah C. Rogers, Boston, Massachusetts.

Claim—Making the insulator cap with the adjustable or turning loop, a, applied to it, and arranged so as to operate substantially as described. Also, combining with the rod or conductor and adjustable rest, applied to it and the insulator cap, substantially in the manner specified. Also, combining with or arranging in the cap of the insulator, and with respect to the insulating material, an annulus or ring, applied substantially in the manner set forth.

263. Tiller Rope Protector; John Sample, Meadville, Mississippi.

Claim—Placing a double casing of metal, made in sections, so as to reach their interior, and with air space between them, around, over, or under the tiller ropes of vessels, to protect them from the accidents of fire.

264. Connexion of Steam Engines with Propellers of Steam Vessels; Ross and Thomas Winans, Baltimore, Maryland.

Claim—The combination of two engines or sets of engines with an intermediate vertical transverse propelling wheel, to the shaft of which the engines are directly connected, substantially as set forth.

265. Steam Engines; C. A. Schultz, City of New York.

Claim—The revolving cam wheel, with the opening cams and adjustable cut-off cams, constructed as described. Also, the socket, with guide rods.

266. Machine for Mining Coal; Elisha Simkins, Allegheny, Pennsylvania.

Claim—1st, The arrangement of the double or compound slide and sliding frame, when used in connexion with the stationary frame, and operated by the screws and the nut, as described. 2d, The arrangement of the cam, slide rack, wheel, shaft, shifting piece, levers, ratchet wheels, and the ratchet pawls, for the purpose of moving the upper end of shaft back and forward, and for operating the screws, as described. 3d, The arrangement of lever and the connecting rod, for the purpose of regulating the angle of the picks, as described. 4th, The arrangement of the flexible connecting rod, the crank, the shaft, the arms, the pick receivers, and the picks, as described.

267. Washing Machine; H. E. Smith, Philadelphia, Pennsylvania.

Claim—The vessel, with its yielding valved diaphragm and the perforated diaphragm, or its equivalent, in combination with a pipe communicating with the vessel at a point above, and the pipe at a point below, the said diaphragms, and both pipes communicating with any suitable heating apparatus, substantially as set forth.

268. Machine for Drawing Bolts; C. L. Stevenson, Charlestown, Massachusetts.

Claim—A machine for drawing bolts from timber, consisting essentially of the rotating toothed wheel, which is forced up to the bolt by pressure applied through the roll, or its equivalent.

269. Applying Power to Cranks of Engines; Thomas Stewart, Philadelphia, Pennsylvania.

Claim—Keeping the piston rod at rest, whilst the crank makes about one-fourth of its revolution on each opposite side of an imaginary line passing across the centre of said crank's shaft, at right angles with another, such line passing through the axis of the piston rod, the same being effected by means of the yoke, or its equivalent, constructed so as to operate upon the crank, substantially in the manner described.

270. Bee Hives; Peter Taltavull, Washington City, D. C.

Claim—The arrangement of a simple rectangular containing box, suspended diagonally, in combination with honey boxes therein arranged similarly, all having outlets or passages downwards from their extreme lower edges, whereby the entire hive is rendered self-clearing, and a sloping roof by the same arrangement is produced, substantially as specified.

271. Machinery for Pearling, Polishing, and Finishing Rice; R. P. Walker, City of New York.

Claim—The revolving cylinder, coated with emery and carrying the sectional rubbers of gum elastic, or equivalent material, in combination with the hollow cylinder revolving in the opposite direction to the cylinder, for the purpose of pearling and polishing rice or grains in substantially the manner specified. Also, the cylinder, constructed with alternate screens and emery surfaces, to act in connexion with the interior revolving cylinder, d, to remove and pass away the douse and chits.

272. Apparatus for Generating Gas; A. B. Wilson, Waterbury, Connecticut.

Claim—1st, The combination of a still with passages leading therefrom downward to a pipe, and so combined therewith as to protect the still from heat, the two being constructed as specified. 2d, In combination, a gas still, converting passages, and a valve, all combined substantially in the manner set forth.

273. Apparatus for Cooling Warts; John Wilkins, Troy, New York.

Claim—1st, The cooling apparatus, as described, with the thin metallic operating plate placed horizontally and fastened so as to be easily removed for the purpose of cleaning, together with the specific arrangement of ribs and joists, or their equivalents. 2d, The distributing and collecting troughs with their respective ice water and waste water troughs, at the ends of the operating plate. 3d, The combination of the said parts, namely, the operating plate with its joists, ribs, and modes of fastening troughs at each end, and regulating valve, or of parts substantially the same, when they are employed as a cooling apparatus, in the manner set forth.

274. Window Stop; Turner Williams, Providence, Rhode Island.

Claim—The roller, shank, spring, lever, or their equivalents, in combination with the inclined surfaces, and operating in the manner substantially as set forth.

275. Hulls of Steam Vessels; Ross and Thomas Winans, Baltimore, Maryland.

Claim—Constructing the hull in the form of a spindle, substantially as described.

276. Steam Vessels; Ross and Thomas Winans, Baltimore, Maryland.

Claim—1st, The combination of a spindle-shaped hull, formed of two separate water-tight vessels, united by a sleeve or framing, with a propeller, arranged and operating substantially as set forth. 2d, The sleeve, in combination with the ribs or standards, for connecting the two end portions of the spindle-shaped hull, steadying the vessel as a keel does, and directing the course of the water as it enters and leaves the space occupied by the propeller. 3d, The combination of the two end portions of the spindle-shaped hull, with the towers and the bridge between them, for the purpose of affording ingress to, and egress from, each end of the hull,

and a means of communication between them, and also supplying a suitable means of ventilation of the two parts of the hull, substantially as set forth.

277. Construction of Ocean Steamers; Ross and Thomas Winans, Baltimore, Maryland.

We are aware that it has been proposed to use an annular propeller revolving around a vessel, but such a form, from the great amount of friction produced, and its liability to distortion, owing to its want ot strength, could not be employed with success; besides, our invention is easily distinguished from such a contrivance, as this refers only to a propelling wheel, which has a continuous radial support from the axis of rotation. All such arrangements are therefore essentially different from ours, and we

Claim—The combination of a vertical transverse trunk within the hull of a vessel, with a screw propeller of large diameter whose blades shall project beyond the outline of the hull, substantially as set forth.

278. Preparation of Aluminum; Luige Ferrari Corbelli, Florence, Tuscany, and Vincent Paitti, of the Duchy of Modena, Assignors to L. Ferrari Corbelli, aforesaid.

Claim—1st, The combination of operations set forth, whereby we are enabled to reduce aluminum from earthy matters containing it as a base, or in combination with other matters. 2d, The application of the prussiate of potash to the clay or earthy matters, and the treatment of such clay or earthy matters with prussiate of potash in the presence of heat, substantially as described.

279. Arithmetical Proof Rule; S. S. Young, Eaton, Ohio,

Claim—The described instrument for proving the result of arithmetical calculations, when constructed and operated substantially in the manner set forth.

280. Manufacture of Aluminum and Calomel; Luige Ferrari Corbelli, Florence, Tuscany, and Vincent Paitti, of the Duchy of Modena, Assignors to Luige Ferrari Corbelli, aforesaid.

Claim—The process described of manufacturing at the same time aluminum and protochloride of mercury, by means of galvanic precipitation, as set forth.

281. Patching Balls for Breech-loading Rifles; L. H. Gibbs, Assignor to the Gibbs' Arms Company, City of New York.

Claim—The method of patching a rifle ball, substantially as set forth.

282. Hinges; R. Hart, Washington Co., Assignor to T. F. Hall, Marietta, Ohio.

Claim—The employment of the shifting yoke, and in combination therewith of the spring, constructed substantially in the manner set forth. 2d, The combination of the hook or part having a salient angle, constructed substantially as above set forth, with the inclined plane for closing and opening gates and doors.

283. Bureau Bedstead; Francis Hoffman, Assignor to self and John Muzell, City of New York.

Claim—A bureau bedstead, in which the bed bottom is hinged so as to fold and expand horizontally when opened or closed, as described.

284. Compositions for Roofing; Josee Johnson, Assignor to J. Ditto & Co., City of New York.

Ciaim—The use of mica for roofing, covering the sides of buildings and boat decks, as set forth.

285. Water Motors; Caleb Rider, Plymouth, Assignor to G. T. McLauthlan, Boston, Massachusetts.

Claim—The union or combination of the following elements or features, viz:—1st, Making the inlet aperture of the tub, and the outlet apertures of the wheel of the same aggregate area. 2d, Forming the buckets of two planes or curves, the lower one making an angle of 26°, or thereabouts, with the plane of rotation of the wheel, and 90° with the float or upper portion of the bucket. 3d, Making the tub circular and of sufficient height and diameter to allow free action of the water therein, and causing the water to enter from the flume on a tangent thereto, whereby the inlet current is relieved from immediate and direct contact against the floats and buckets of the wheel, and caused to spend its force upon the waters already accumulated in the tub, and through that upon all the floats and buckets of the wheel itself, the whole forming a water motor, arranged substantially as dsscribed.

286. Sewing Machines; A. W. Sangster, Assignor to V. M. Rice, Joel Thayer, James Sangster, and Eliza Remington, Buffalo, New York.

Claim—The combination of the cam or wheel provided with one or more projections on its periphery, with the adjustable foot-piece, or its equivalent, for feeding the cloth and regulating the length of stitch in the manner described, and without the use of an intermediate feed-piece.

287. Forming Bats for Felt Cloth; M. D. Whipple, Charlestown, Assignor to A. B. Ely, Boston, Mass.

Claim—1st, Shortening the staple, in the manner and for the purpose substantially as set forth, previous to forming the bat. 2d, The combination of the draw rolls with a brush cylinder, a doffer, and a suitable device upon which to form the bat, operating in the manner substantially as described.

288. Machinery for Fulling Cloth in the Piece; M. D. Whipple, Charlestown, Assignor to A. B. Ely, Boston, Massachusetts.

Claim—Fulling or felting cloth in the piece by the action of rollers revolved alternately in one direction and the other, when the cloth is wound loosely on a spool, in the manner substantially as set forth.

289. Machinery for Combing Cotton; M. D. Whipple, Charlestown, Assignor to A. B. Ely, Newton, Mass.

Claim—1st, The vibratory elastic feed rolls and permanent knife edge for holding the staple, as set forth. 2d, The combination of a feed for introducing the material into the machine, the vibrating card, and nippers, and the stationary cards, operating in the manner substantially as described.

Extensions.

1. Method of Rendering Lard; Ebenezer Wilson, Cincinnati, Ohio; patented October 9, 1844; re-issued May 7, 1850; extended October 7, 1858.

Claim—In the described apparatus for extracting or rendering lard, &c., by the action of high pressure steam, combining with a steam-tight tank, and provided with one or more discharge holes, for the discharge of the residuum, and with a perforated steam pipe at the bottom for the introduction of high pressure steam, a perforated false bottom above the steam pipe to sustain the charge under the weight and pressure, to admit of and insure free passage of the steam through the charge, and also the free descent of the water of condensation. Also, in combination with the tank, substantially such as herein described, the employment of one or more try cocks near the top thereof, and a regular discharge cock at or near the bottom, for the purpose of ascertaining when too much water of condensation has accumulated, and to discharge the same, to retain a

sufficient space above for steam to insure the pssage of steam through the charge. Finally, in combination with a tank, the employment of a series of discharge cocks arranged at different levels for the purpose of drawing off the rendered lard, &c., as it floats on the water of condensation, and thus insure the separation of the pure lard, &c., from all foreign substances, when this is combined with the relief or discharge cock, as described.

2. Steam Boilers; Frederick E. Sickles, City of New York; patented October 19, 1844; extended October 8, 1858.

Claim—1st, My improvement in the periods of the movements of the valves, by which they are opened and closed relatively to each other and to the movement of the piston, by means of which the piston completes each stroke in equilibrio. or nearly so, without admitting steam against the movement of the piston, by a lead to the steam valve, which is effected as before stated by opening the lower exhaust valve, before the end of the upward stroke of the piston, and before the upper exhaust valve is closed, and opening the upper exhaust valve before the end of the downward stroke of the piston, and before the lower exhaust valve is closed—the movement of the steam valves being so regulated as to admit steam to the cylinder only after the exhaust valve on the corresponding end of the cylinder has been closed. Also, as my next improvement, as a means of carrying into effect my first and essential improvement, the arrangement of the toes on the rock shaft in such manner relatively to the location and forming of the feet on the lifting rods, that at the middle, or nearly so, of the rocking motion of the rock shaft, both lifting rods, with their exhaust valves, shall be partly up, as described. Also, in combination with this arrangement, the slip of the lifters on the steam valve stems, to ensure the closing of the exhaust valves before the opening of the steam valves on the corresponding ends of the cylinder, as described.

Additional Improvement.

1. Metallic Hoops for Fastening Cotton Bales; James R. Speer, Pittsburgh, Pennsylvania; patented Dec. 1, 1857; additional dated October 26, 1858.

Claim—As an improvement on my improved clasp of March 23, 1858, the use of a clasp for metallic bands, constructed as described, having a single aperture only for the insertion of the hooked ends of the band, the plate of iron of which it is formed being bent across the aperture, so as to present a sufficient opening for the ready insertion of the hooked ends of the bands, in the manner described.

Re-Issues.

1. Manufacture of Paper from Wood; Wm. F. Ladd, City of New York, and Morris L. Keen, Philadelphia, Pennsylvania, Assignees (through mesne-assignment) of Charles Watt and Hugh Burgess, London, England; patented July 18, 1854; ante-dated August 19, 1853; re-issued October 5, 1858.

Claim—The pulping or disintegrating of shavings of wood and other similar vegetable matter for making paper, in the manner substantially as described, according to the nature of the vegetable substance to be treated.

2. Wear Iron for Carriages; I. George Lefler, Philadelphia, Pennsylvania; patented Sept. 8, 1857; re-issued October 5, 1858.

Disclaiming the formation of "goose-necks," or recesses in the bodies of vehicles, and disclaiming the use of metallic guards or "wear irons."

Claim—Without limiting myself to any precise form or exact proportion, the construction of carriage or other bodies with a metallic recessed guard, constructed and arranged in the body of the vehicle, substantially as described, for the purpose set forth.

3. Cleansing Sugar; Francis P. Hurd, Assignee (through mesne-assignment) of Joseph Hurd, Stoneham, Mass.; patented Oct. 3, 1844; extended Oct. 2, 1858; re-issued October 5, 1858.

Claim—1st, The process of separating sugar from any liquid matters with which it may be mixed, by filling the mixed mass into a vessel constructed and then acting upon the same by centrifugal force, substantially in the manner specified. 2d, The washing of impurities out of the sugar, by admitting a liquid into a vessel in which sugar is being exposed to the action of centrifugal force, as specified. 3d, The process described of obtaining a mass of sugar free from liquid impurities by filling the mixed mass into the top of a vessel, constructed substantially as described, and having a closed bottom, and there exposing the mass to the action of centrifugal force, and then withdrawing the sugar out of the upper end of said vessel when separated. 4th, The process of obtaining a mass of washed sugar by charging sugar into the top of a vessel, constructed as specified, with a closed bottom, and then exposing such sugar to the action of centrifugal force, and while so exposed, admitting currents of liquid to wash the sugar. Finally, withdrawing the washed sugar out of the top or upper end of the vessel, as specified.

4. Dry Gas Metres; Alexander A. Croll, London, England; patented February 22, 1853; re-issued October 5, 1858.

Claim—Fastening the diaphragms to the partition plate, and on either side thereof, in contradistinction to attaching them by separate flanch rings to the sides of the metre, and at or near the front and back thereof. Also, the arrangement of pendant rods or levers, with suitable guides near the outer edges of the disks on opposite sides of their axis, to steady and direct the motion of the movable partitions, as described. Further, continuing the inlet and outlet pipes down the sides of the rectangular case, below the points required for the passage of the gas to and from the metre, to form separate condensation chambers. Likewise, enclosing by a separate interior cover or case, the valves of the metre, for protection of the operating and registering gear from gas, and to facilitate adjustment, substantially as set forth.

5. Chairs; James Fernald, Boston, Massachusetts; patented July 22, 1856; re-issued Oct. 12, 1858.

Claim—The new manufacture of chair backs, composed of a convex-faced solid block of wood, and a single metallic support rod, they being constructed and applied together and to the chair seat, essentially as specified. Also, making the back rest oblong or oval, when made to rotate in the manner specified.

6. Bolting Flour; Edward Broadfield, Rochester, New York; patented September, 1846; re-issued October 12, 1858.

Claim—1st, The cast heads or annular rings with the flanch and hubs, or any mechanical equivalent therefor, when used in connexion with wire cylinder or circular wire bolt. 2d, In combination with the chain, the cylindrical journals, or their equivalents, by means of which the bolt revolves in or on a support inside the space for admitting the feed instead of on the outside, as in the English bolt. 3d, The combination of the

cards or metal points and brushes, attached to bars of the inside cylinder, for the purpose specified. 4th, The spout, when arranged in relation to the cylinder or bolt, and used in connexion with said cylinder or bolt, and the inside brush cylinder, as specified.

7. Sewing Machines; The Grover and Baker Sewing Machine Co., Boston, Assignors of Shelburne C. Bloodgett, Georgetown, Massachusetts; patented December 20, 1853; re-issued October 12, 1858.

Claim—The formation of sewing in cloth or other material, by the interlooping of two threads by the conjoint action of two needles, in such manner that each needle shall be made to carry a loop of thread through a loop formed by the other needle and through the cloth, whereby one thread serves as a binding thread to the other, substantially in the manner described. Also, moving the cloth to be sewed by a needle, or its equivalent, operating substantially as herein set forth, to pierce the cloth and move it the necessary distance required to form successive stitches.

8. Ventilating Attachment to be Applied to Pumps; G. C. King, Assignee of C. N. Lewis, Seneca Falls, New York; patented November 17, 1857; re-issued October 26, 1858.

Claim—The arrangement and combination of the perforated base, cap, and perforated tube, or other equivalents, with the pump barrel, as set forth, whereby the ventilator becomes attached to, and forms a part of, the pump.

9. Elliptic Cushion for Railroad Cars; R. Jones, York, Pennsylvania; patented April 27, 1858; re-issued October 26, 1858.

Claim—1st, The local relation and mode of application of the semi-elliptic buffer to any and all cars whereever applied, in such manner as is represented by the letters, and for the purposes set forth. 2d, The combination and arrangement of the elliptic cushion for easing off collisions, as described, and arranged in every part thereof, in the frame work, as represented by the letters, and operating substantially in such manner, and wherever applied to cars, as described, and for the purpose set forth.

Designs.

1. Cast Iron Fences; Martin Briggs, Rochester, New York; dated October 5, 1858.
2. Trade Marks; Richard P. and Charles Bruff, and George A. Scaver, City of New York; dated October 5, 1858.
3. Cooks' Stoves; N. S. Vedder, Troy, Assignor to G. W. Eddy, Waterford, New York; dated Oct. 5, 1858.
4. Cast Iron Fire Shovels; Wm. Bennett, City of New York; dated October 12, 1858.
5. Lockets; R. C. Randall, Providence, Rhode Island; dated October 19, 1858.
6. Cast Metal Tablets; Ezra Clark, Portland, Assignor to Seth Clark, Westbrook, Maine; dated Oct. 26, 1858.

MECHANICS, PHYSICS, AND CHEMISTRY.

*Ice Phenomena, from Observations on Rice Lake.** By J. H. Dumble, C. E.

The phenomena attending ice are, I believe, but little understood or investigated in Canada. That water increases in bulk during the process of crystallization is well known. The mere facts, that ice floats on water, and that vessels of any description which contain water fracture while it is congealing, are proofs sufficiently practical. But that ice itself should be capable of expanding and increasing in bulk is not equally well known, although many practical proofs are afforded.

This property of expansion and contraction of ice aids in fracturing and reducing the floating and gigantic iceberg; and Dr. Kane tells us, that but for changes of ice at temperatures *far below the freezing point*, causing pressure, collapse, fracture and disruption, the short Arctic summer would fail to open the Arctic Seas. I may add, that the ignorance, or want of a proper appreciation, of the properties of ice, evinced in the construction of numerous wharves, piers, and bridges on the inland lakes and rivers of Canada and the Northern States, has proved a source of infinite annoyance and of immense expense.

The Cobourg and Peterborough Railway bridge across Rice Lake supplies a remarkable instance, from observations of the effects of ice

* From the Canadian Jour. of Industry, Science, and Art, Sept., 1858.

on which some valuable practical conclusions may be deduced. Timber being plentiful along the shores of this lake, a cheap and substantial form of pile and truss bridge was constructed.

This bridge on more southern waters would doubtless have been considered a most suitable structure, but owing to the violent and almost irresistible force of ice, while expanding, a considerable portion of this structure now presents the appearance of a complete wreck. Having, as Engineer of the Cobourg and Peterborough Railway, had two winters' experience of ice phenomena on Rice Lake, and having carefully noticed the peculiar circumstances attending the various movements of the ice, I submit my observations and remarks, hoping that from them a somewhat satisfactory and perhaps correct theory may be deduced.

In the first place, it is well to know, that the violent movement of the ice on Rice Lake is that of contraction and expansion, caused entirely by *change of temperature.* The lake generally "takes" with ice during the month of December at a pretty high water level, which level the dam across the outlet preserves until spring. Currents, therefore, cannot be said (as in the case of rivers) to influence the movements of the ice. Neither have we on Rice Lake those other various causes, such as differing temperatures of ice and sea water, currents, or wave action, which produce the disruptions of Arctic ice. It is observed on Rice Lake that the action of the mid-day sun will set the *glare ice* immediately in motion. Warm winds, snow storms, and rains, do likewise produce the same effect, when the ice is glare and free from water or snow. This motion is generally quite perceptible; it is not shrinkage or contraction, but on the contrary is a visible stretching and expanding of the field-ice, generally towards the shores of the lake and of islands. The movement of the ice is at times very gradual, and is accompanied by a slight crackling noise. Again the expansion is rapid and violent, the movement being by a succession of vigorous jerks, accompanied by a hollow rumbling sound, seemingly from under the field-ice, while at intervals there occur sharp loud reports like that of cannon.

That ice does *expand* under such circumstances is very evident, as it may be seen creeping many feet on to the shores, without the appearance in the lake of any compensating fissures whatever. Ice may therefore be said to expand by a *high temperature*, that is, by a temperature higher than that which had just previously existed. The phenomena of ice contracting and expanding at the same temperature on different occasions is sometimes witnessed. For instance, should the thermometer indicate a temperature of minus 30°, and then suddenly rise to zero, expansion would immediately be the result; again, should the temperature indicate plus 30°, and suddenly fall to zero, contraction of the ice would speedily follow. The force and violence with which ice expands or shoves depends entirely on the *extent* of the *change* of temperature. The most violent shoves of ice occur previous to rain storms. A rise in temperature of 20° or upwards produces violent expansion. Various instances may be cited of the effects

produced by ice when expanding; evidence of its power is very indelibly written on parts of the Railway Bridge before-mentioned. Portions of this structure on piles have been, for long distances, bent and inclined even to an angle of 45° in a most uniform and extraordinary manner. Strong oak piles that would not bend have been cracked and splintered, hundreds of heavy cap timbers of sound pine have been snapped across like reeds, and heavy iron rails have been curved and doubled up, by the almost irresistible pressure of the ice.

Instances of trees growing on the shores having been torn up by the roots are of frequent occurrence. Large boulders weighing two tons or more, have been lifted several feet from the shore, and then pressed into the timbers forming the abutments of the bridge.

Channels cut for the purpose of moving timber frequently close by the expansion of the field ice, and the timbers are heaved out high and dry.

The greatest amount of expansion that I have witnessed at any one time in a horizontal direction was six feet. This may be considered a maximum shove.

When ice shoves on to the shores of lakes or islands it presents different forms of fracture, according to the nature of the resistance it meets with. Should the shore be low the ice merely runs up and fractures at the ripple mark. On the contrary, should the ice meet with resistance from a vertical shore or pier, a bursting up and piling of the fractured pieces would be the result.

Ice when contracting presents precisely the reverse of this fractured appearance. From my experience of ice I believe it is susceptible of contraction, but to a very limited extent. I have witnessed many sudden changes of temperature on Rice Lake, in some instances from plus 30° to minus 20°, indicating a fall of some 50°; and yet the contraction of the ice, as made visible by open fissures, has not exceeded three inches.

I have repeatedly heard of openings, that have occurred during former years, of several feet in width. I am inclined, however, to believe, that the distinction between a shove and an open crack, or fissure, was not sufficiently understood by my informants.

I have witnessed in several shoves that when the ice contracted, the fractured and elevated pieces, which previously came in contact with each other, would fall, and perhaps partly under the field-ice. A space in the centre thus presented open water. This open water has probably been mistaken for a fissure caused by contraction.

I have heard of open fissures that have been seen eighteen inches in width, and this I think under peculiar circumstances, quite probable. That these fissures do sometimes occur, and that they never do occur unless the thermometer indicates a decided fall of temperature, is sufficient proof that ice contracts by a change to a temperature lower than that which had just previously existed. I may add, that contraction occurs generally at night, and is accompanied by sharp reports. A uniform temperature of the atmosphere does not cause either expansion or contraction of ice; it matters not whether the

temperature be high or low, no movement of any kind takes place. A coating of snow of any depth over six inches effectually prevents any motion in ice, by protecting it from the influences of the atmosphere.

I find from repeated experiment that the upper stratum of ice partakes of the temperature of the atmosphere (up to 32°). The lower stratum maintains a constant temperature of some eight degrees below that of the underlying water. A fall of temperature, therefore, affects only the upper stratum, while the lower stratum remains unaffected. A separating and fracturing of the mass at its weakest point must of course be the result. Just the contrary effect is produced when the upper stratum is affected by a high temperature; shoving and overlapping is the consequence.

Ice, unlike most other solids, does not seem to possess the property of contraction to the same extent as it does the power of expansion. This will seem apparent from the following evidence:—When ice expands, and is forced perhaps six feet on to the shore, it is observed that should the temperature again fall, this ice, which had previously exceeded its limits, does not recede to its former position, neither will the main field separate over a few inches from the fractured portions on the shore. On the contrary, should the temperature again suddenly rise, a still further advance of perhaps the same distance is made on to the shore.

This repeated expansion may occur many times during a winter, and yet little evidence of any contraction will appear. I have known channels some six feet in width, opened for the purpose of isolating the Rice Lake bridge, to be closed eight times within a month by the expansion of the field-ice.

An extraordinary instance of ice piling was witnessed on our new embankment. The ice shoved from both sides until the fractured pieces met in the centre of the track. The embankment is twenty-six feet in width at water level, and the rail is some six feet elevated.

The next phenomenon of ice, and that which seemed the most perplexing and difficult to acconnt for, is the fact of ice shoving from different directions at different periods. In the first place it was noticed that it rarely or never shoved or fractured towards the centre of the lake; but on the contrary, the ice on the shores of the lake and of islands exhibited unmistakable signs of commotion.

It is but reasonable to suppose that any solid, equally dense throughout its dimensions, and susceptible of expansion, would, when equally acted upon by the active agent or moving cause, expand from its centre towards its circumference. We find such is the effect produced on any large field of ice of equal thickness and density, when acted upon uniformly by either the mid-day sun or warm winds. It is a fact, however, that it moves from other directions than from the centre of the lake. Shoves are sometimes witnessed from the east and sometimes from the west, to the north and to the south.

This phenomenon seemed as if it would baffle investigation, and it was only by careful observation of all the circumstances attending the

formation and movements of the ice that I could deduce a theory to my satisfaction. It would perhaps be well to describe that portion of Rice Lake which came within my observation. The railway bridge crosses the lake at its widest part. An island, containing some three acres of land, is situated on the line of the bridge, about three-fourths of a mile from the south shore. The bridge is formed of pile bents, with the exception of that portion immediately to the north of Tic Island, which is a continuous truss for half a mile. To the east is a wide and unobstructed expanse of water ; at the distance of perhaps four miles from the bridge, the lake is narrowed by two promontories to a mile in width. Less than a mile to the westward a succession of beautiful islands rise from the lake. The Otonabee River, a large sluggish stream, enters the lake opposite those islands from the north. We have then at this particular part of the lake some twelve square miles of water-way. When this large space is therefore covered with glare ice, and is swept by warm winds after a previous low temperature, the amount and force of its expansion is somewhat surprising.

An instance of expansion from the centre of this large field may be cited:—In December, 1857, the lake was covered with dense glare ice five inches in thickness. The temperature was extremely low (ranging from minus 10° to minus 30°) for some time after the ice formed, it suddenly rose to plus 30° previous to rain. The expansion that followed was of the most violent description. The truss bridge superstructure moved two feet six inches on to Tic Island; the pile bridge south of the island was forced four feet and a half on to the south shore. The bridge was slightly shoved to the north, but was mainly preserved by the parallel channels that happened to be open for the purpose of isolating it in that direction. The centre of the bridge was not affected in the slightest, it being the neutral point. The ice was piled on to Tic Island from the north, east, and west, but on the south side it was torn away from the shore, exhibiting a fissure or opening some twenty inches in width.

Instances of the ice shoving on to the north and south shores of the lake, and also on to the shores of islands at the same time, are frequent. In fact, when the ice is equally dense and glare, and being fairly acted upon by a warm atmosphere, it must naturally expand from its centre to its circumference. But ice, owing to the peculiar circumstances under which it sometimes forms, is not found to be equally pure or dense, neither is it of uniform thickness. This ice is irregularly acted upon by warm winds, or by the slanting rays of the sun at different altitudes, shoves or expands from various directions other than from the centre of the lake. During the early part of the last winter the ice shoves were entirely from the east, in the vicinity of the bridge. Upon an examination of the ice, I found that to the eastward glare and dense, the ice to the west of the bridge was not so pure, but was seemingly thicker and more porous. This difference in its character was owing to snow having fallen during its formation; the bridge had retained the snow to the westward, and it became incorporated with the new ice.

The large open expanse to the east was constantly swept by the wind. The glare ice became the most dense during cold weather, and of course the most susceptible of expansion by heat. Consequently the shoving was (until subsequent rains had changed the relative character of the ice) from the stronger and most susceptible ice towards the weaker and less expansive.

Ice on any large and irregular sheet of water studded with islands, like Rice Lake, must naturally be of unequal thickness and density. I have therefore no doubt whatever, that the phenomenon of ice expanding and shoving from various directions is caused by the *unequal thickness*, *density*, and *glareness of the ice*, and likewise by the *manner* in which the *heated atmosphere strikes it.*

The fact that channels opened in the lake (no matter whether transversely or longitudinally,) always close up on the ice exhibiting the slightest tendency to expansion, is another proof that ice invariably expands and shoves to the line of such least resistance, and under peculiar circumstances from a general centre of the field.

On mentioning these circumstances to a friend from Kingston, he asked: "If ice moves from the centre of the mass, why is it, that it does not do so between Kingston and Wolf Island?" and stated, that on the contrary, a longitudinal shove and fracture are generally witnessed in the middle of the stream. I replied that the centre of the stream was generally the last to take, and being consequently the weaker ice, was sure to be crushed and fractured by the stronger ice on each side while expanding. I heard a seaman state, that he discovered the channel of a harbor (formed by the entrance of a river into the Black Sea,) by the appearance of an irregular line of fracture in the ice.

Another instance of ice expanding towards the line of least resistance may be cited:—When Presque Isle Harbor is entirely frozen over, any expansion of the ice is apparent by its encroachment on the shore. But when the bay is but partially frozen over the expansion is towards the open water, and is not visible on the shores.

In conclusion, I would mention another circumstance that occurs during the expansion of ice. It is observed, that when a large extent of field-ice expands towards the shore it does not shove into deep bays, but fractures from point to point, in a zigzag manner across the chord at the mouth. The thrust of the main field must find less resistance across this chord than around the area of the bay.

Ice is a most delicate thermometer, and from the brief statement of facts connected with its phenomena the following general inferences may be derived:

1st. That ice is capable of expansion and contraction.

2d. That ice (up to 32°) expands with a temperature *higher* than that which *had just previously* existed.

3d. That ice contracts with a temperature lower than that which had just previously existed.

4th. That ice does not expand or contract with a uniform temperature.

5th. That ice is susceptible of expansion to a much greater extent than of contraction.

6th. That when ice is equally dense, thick, and glare, and equally acted on by a heated atmosphere, it expands from the centre towards the circumference.

7th. That ice expands towards the line *of least resistance.*

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*Vegetable Parchment.**

Several of our readers are doubtless aware that an invention was not long ago brought before the public, by which common unsized paper was converted into a substance strongly resembling parchment, and which received the name of vegetable parchment or parchment paper. Mr. Gaines was the inventor, but the working of the invention has been undertaken by Messrs. T. De La Rue & Co. The process consists in immersing the paper for a few seconds, in sulphuric acid, diluted with half its volume of water—the acid being afterwards got rid of. The substance thus produced has been submitted to Dr. Hoffman, the eminent chemist, a copy of whose interesting report is now before us; and our readers will probably be glad to have the substance of it laid before them. The substance (says the doctor) exhibits in most of its properties so close an analogy with animal membrane, that the name adopted for the new material seems fully justified. In its appearance, vegetable parchment greatly resembles animal parchment; the same peculiar tint, the same degree of translucency, the same transition from the fibrous to the horn-like condition. Vegetable, like animal parchment, possesses a high degree of cohesion, bearing frequently repeated bending and re-bending, without showing any tendency to break in the folds; like the latter, it is highly hygroscopic, acquiring by the absorption of moisture increased flexibility and toughness. Immersed in water, vegetable parchment exhibits all the characters of animal membrane, becoming soft and slippery by the action of water, without, however, losing in any way its strength. Water does not percolate through vegetable parchment, although it slowly traverses this substance like animal membrane by endosmatic action.

After remarking that to produce a perfect result, attention must be paid to the exact proportion of acid and water, the time of immersion, and the temperature; and after stating that he had proved experimentally that the acid had produced no chemical change in the constitution of the paper, but had caused only a molecular arrangement of the constituents, he says, that he next proceeded to ascertain whether the process employed to remove the sulphuric acid from the paper had produced the desired effect. If any acid remained, the destruction of the paper, within a greater or less period of time, was certain. Now, the process consists in long continued mechanical washing with cold water, immersion in a dilute solution of caustic ammonia, and, lastly,

* From the London Practical Mechanics' Journal, October, 1858.

renewed washing with water. This process was found, on analysis, to have been attended with complete success; for not a trace of free sulphuric acid could be found.

The doctor then performed some experiments on the strength of this material, as compared with that of the animal parchment, with which it is likely to enter into competition. For this purpose, bands of vegetable and of animal parchment both $\frac{7}{8}$ of an inch in width, and as far as possible of equal thickness, were slung around a horizontal cylinder, and appropriately fixed by means of an iron screw clamp pressing both ends upon the upper part of the cylinder. The band assumed in this manner the shape of a ring, into the bend of which a small cylinder of wood was placed projecting on each side about an inch over the band, and carrying by means of strings fastened to each end a pan, which was loaded with weights, until the band gave way. A set of experiments made in this manner led to the result, that paper by exposure to the action of sulphuric acid in the manner described, acquires about five times the strength which it previously possessed, and that for equal weights, vegetable parchment possesses about three-fourths of the strength of animal parchment. It was found, moreover, that bands of vegetable parchment taken from different sheets of the same kind of paper, exhibited a remarkable uniformity of strength, whilst in animal parchment, which, owing to its mode of manufacture, must always present considerable inequality of thickness, extraordinary variations were observed, even if the bands were taken from the same skin. Vegetable parchment, then, as far as strength goes, is not quite equal to animal parchment. On the other hand, the new article greatly surpasses real parchment in its resistance to the action of chemical agents, and especially of water. As has been already stated, vegetable, like animal parchment, absorbs water and becomes perfectly soft and pliable; but it may remain in contact, and even may be boiled with water for days, without being affected in the slightest degree, retaining its strength, and regaining its original appearance on drying; on the other hand, it is well known how rapidly animal parchment is altered by boiling water, by the protracted action of which it is converted into gelatine. Even at the common temperature, animal parchment, in the presence of moisture, is very prone to putrefactive decomposition; whilst parchment paper, in which nitrogen, this powerful disturber of chemical balance, is absent, may be exposed to moisture, without the slightest change either in appearance or properties. It would in fact be difficult to find a paper-like material endowed with greater power of resistance to the disintegrating influences of water than vegetable parchment.

Taking into consideration the chemical composition of the new material, its cohesive power, and its deportment with chemical solvents, especially water, both at the common temperature, and at the temperature of its boiling point, it is obvious that this substance unites in itself, in a most remarkable manner, the condition of permanence and durability; and there need be no hesitation in stating that vegetable parchment, properly prepared, is capable of resisting the tooth of time for many centuries, and that under various circumstances it will last even longer than animal parchment.

The valuable properties of vegetable parchment suggest a great variety of applications for the new material. There is no doubt that parchment paper may be adopted, with perfect security, for all legal documents, policies of insurance, foreign bills of exchange, bills of lading, scrip certificates, and other similar documents, as a substitute for the skins which are now generally used. On the other hand, its comparatively low price would appear to suggest its application in a variety of cases, in which, at present, paper is employed; for instance, for private ledgers of banking houses, or other large establishments, as well as for registries of wills, marriages, baptisms, and deaths, indeed, for all documents the preservation of which is of importance. Many of the documents in question, in order to protect them from injury in case of fire, are generally kept in safes, the majority of which are now encased with solid water,—the water of crystallization in alum, and other similar hydrated compounds. The interior of these safes, in case of exposure to heat, must obviously become filled with steam of a high temperature, and it cannot be doubted that documents written on vegetable parchment, owing to the extraordinary power with which this material resists the action of boiling water and of steam, will stand a much better chance of preservation under such circumstances, than those written on common paper or animal parchment.

As another advantage of vegetable parchment, as compared with animal parchment, the experience may be quoted, that vegetable textures are much less attractive to insects than animal structures. Moreover, to increase the security of vegetable parchment in this respect, the paper, before conversion, may be incorporated with chemical agents which, like salts of mercury, for instance, have been employed with such advantage in the manufacture of paper for public records. Another advantage is, the great difficulty with which words are erased from its surface, and others are substituted in their places. Deeds written on parchment paper acquire thereby a certain degree of security against falsification.

Its strength and resistance to water appear to recommend parchment paper in an eminent degree for engineers' and architects' plans, and especially for their working plans, which are often unavoidably subjected to rough usage and moisture. The thinner sheets of parchment paper, on account of their transparency, present the additional advantage of being useful as a most durable tracing paper. Another field of considerable extent for the application of vegetable parchment appears to be in book-binding, especially ornamental. Books bound in parchment paper are remarkable for the beauty and solidity of their binding. Experienced book-binders, to whom these were submitted, believed them to be bound in real parchment. Even in the manufacture of books and maps, which, like those used for educational purposes, have to stand considerable wear and tear, parchment paper may find a very useful application. The printing on ordinary paper is not changed by the treatment with sulphuric acid, but owing to the shrinking of the paper during the process, it will probably be found more convenient for such purposes to print on the paper after it has undergone the transforma-

tion. Vegetable parchment is remarkable for the facility with which printer's ink, as well as writing ink, may be applied to it, and for its attraction for dyes generally, many of which it appears to take even more readily than calico.

Among the numerous more or less important applications in which parchment paper is sure to be found useful as soon as it becomes accessible to the general public, its adaptation for household, and especially for culinary purposes, must not be left unmentioned.

In closing the orifices of vessels for preserves, &c., few housewives will hesitate to substitute an elegant material like vegetable parchment paper for animal membrane, which is now generally in use.

Formed into bags of which the seams are cemented with the white of egg, parchment paper will be found very useful for the purposes of boiling and stewing, according to the principles of a refined and scientific *cuisine.*

Nor can the chemist fail to derive some benefit from so interesting an achievement of his own science as the transformation of paper into parchment. In the laboratory, vegetable parchment will become a material of general use for connecting retorts and condensers, or other similar apparatus, and on account of its indestructibility by many of the fluids usually employed in electric batteries, it will probably find a further and even more important application in the construction of diaphragms for galvanic apparatus.

Lecture on some of the Improvements in Locks since the Great Exhibition of 1851.* By Mr. Edmund Beckett Denison.

After adverting to the mode in which the old Bramah and Chubb locks had been picked by Mr. Hobbs, of picklock fame, Mr. Denison stated his belief that there was still a notion prevailing among persons, who ought to know better, that the picking of locks by this method required singular skill and dexterity, such as need not be feared from ordinary lock-pickers. This was quite a mistake, now that the method is so well known to every body in the lock trade, and to all who take the trouble to look into any books on the subject. He stated that the long delay of the thieves who opened the box with a Chubb lock on the South Eastern Railway, in the gold dust robbery, only proved that they were greatly ignorant of their business. Any moderately good hand, among, not merely Mr. Hobbs', but Mr. Chubb's own workmen, would have opened the box and shut it up again between London and Reigate. Indeed, in a trial before Lord Campbell, a few years ago, one of Mr. Chubb's men confessed, that the picking of one of his locks, or of any others then known to him, was merely a question of time ; and Mr. Hobbs has several times said in public, that he is acquainted with persons, both in the trade and out of it, who can pick locks quicker than he can, now that the proper way of doing it is known. The lecturer strongly recommended, for cheapness and comparative safety,

* From the London Practical Mechanics' Journal, October, 1858.

Tucker's, Parvell's, and Hobbs' small locks. He stated that one of the good effects of the exposure and defeat of our best locks had been the invention of a greater variety of really different locks, in the last six years, than in the previous sixty or six hundred. The greater number of locks now made has induced the formation of an establishment by Mr. Hobbs for their exclusive factory, and in which, like Colt's revolvers and the American clocks, they are made by special machinery. The small prices at which they are sold is, of course, the result of this mode of construction. It was stated that the common three-inch drawer locks, with four tumblers, equal to the best of 1851, are now sold at 27*s.* a dozen. The principle of all locks above the rank of the common warded locks, whatever may be the details of their arrangement, is this:—There are a number of similar pieces (which may have the name of tumblers, levers, sliders, disks, rings, or pins, according to circumstances,) each with a notch in it in a different place, and until all these notches are brought together into one given position, the pieces in question, or some of them, prevent the passage of another piece in the lock, on which its opening depends. Mr. Denison exhibited a model, made not to resemble any particular lock, but to illustrate this general principle of them all; and he showed on it the application of the "tentative" mode of picking, by applying pressure to the bolts, and then gently moving each of the tumblers or sliders, &c., in succession, on which any pressure is felt, until all the notches come under the piece which has to enter them, and then the bolt yields to the pressure and goes back. The lecturer gave a synopsis of some improvements which had been made, and referred with much commendation to the first invention which really defeated this lock picking, by Mr. Hobbs, in what he calls his "protector" or movable stump lock. In this, as soon as you try to make the bolt press upon the tumblers, the pressure is taken off them altogether, and transferred to a fixed pin in the lock, which would prevent it from being opened in that state of things, even if all the tumblers were then raised to the proper height. This is done by the movable stump, the action of which is freely described in the rudimentary treatise on locks in *Weale's Series.* Mr. Denison said that this invention, in its present form, is perfectly effectual against any mode of picking yet known. He then described a lock of his own invention, not intended for furniture and small work, but for doors of safes, prisons, and other places where strength and security are required.

Before the Royal Institution.

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*Type Map.**

A telegraphic map of Europe, entirely executed in typography, has been presented to the Society by Mr. R. Decker, of the Royal Printing Office, Berlin. It is the work of Mr. A. Mahlan, who is employed by Mr. Decker in the above establishment. It is remarkably clear and beautiful. The process by which it has been produced is described as

* From the Journal of the Society of Arts, No 293.

follows: —The drawing of the map, made on paper, is blackened at the back with a carbonic tracing composition, and is placed, blackened side downwards, on a surface composed of quadrats, formed each by sixteen nonpareil squares, and by means of a point the lines are transferred to them. The quadrats over which the lines are traced are then exchanged for nonpareil type, cast with a face of points, and the coast line is formed by the inner portion of these points being cut away. The telegraphic lines are formed of brass rules, fixed in nonpareil type body, as a sort of legs, which can be inserted into the composition, when needed, by taking out the quadrat, the legs being so adjusted in length that the upper edge of the rule is level with the face of the type. The additional shading of the coast line is effected by the insertion of nonpareil type cast with points on the face. The names of places are inserted by means of type taking the place of the quadrats where required.

The effect produced is peculiarly good. How far this is ever likely to supersede the present methods of producing maps by engraving and transfer to lithographic stone, is questionable; no details as to the cost are given, and it seems very doubtful (however simple the process appears,) whether the result can be satisfactorily produced except by a skilled workman, whose labor must be adequately remunerated.

A new form of Mercurial Barometer.

M. de Celles exhibited to the Academy of Sciences of Paris, a mercurial barometer constructed under his direction. This barometer is the instrument of Torricelli, with the following modifications: 1st, the diameter of the barometric chamber is increased in proportion as it is desired to make the instrument more sensitive; 2d, the cistern is replaced by a horizontal tube 0·15 ins. or 0·2 ins. in diameter, and of a length proportionate to the sensibility of the instrument. The instrument has the form of a square. Slight variations of the height of the vertical column correspond to considerable, but always proportional movements of the horizontal leg. This ratio is inversely as the squares of the diameters. An index of iron placed in the horizontal tube is pressed outward while the pressure of the air is diminishing, and is left when the column returns. It marks the minimum pressure, and may be brought back by a magnet. M. de Celles claims for this instrument the three advantages: 1st, of very great sensitiveness. 2d, a constant level. 3d, a minimum index.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, December 16, 1858.

John C. Cresson, President, in the chair.

John Agnew, Vice President.
John F. Frazer, Treasurer.
I. B. Garrigues, Recording Secretary.
} Present.

The minutes of the last meeting were read and approved.

Letters were read from the Royal Society, of London, and James Eives, of London; the Royal Cornwall Polytechnic Society, Falmouth, England, and L. A. Huguet-Latour, Esq., Montreal, Canada.

Donations to the Library were received from the Royal Geographical Society, and the Institute of Actuaries, London; the Royal Irish Academy, Dublin, Ireland; L. A. H. Latour, Montreal, Canada; the Fire Department of the City of Detroit, Michigan; the Commissioners of Indian Affairs, Washington City, D. C.; William Lenoir, of Lenoirs, Tennessee; Dr. Charles M. Wetherill, Lafayette, Indiana; Charles E. Smith, Esq., Dr. Isaac N. Kerlin, Messrs. Merrick & Sons, John E. Addicks, Esq., Dr. L. Turnbull, Dr. B. H. Rand, and Geo. M. Conarroe, Esq., Philadelphia.

Donations to the Cabinets were received from Walter Cresson and Amos A. Jones, Esqs., Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement of the receipts and payments for the month of November.

The Board of Managers and Standing Committees reported their minutes.

The Committee on Exhibitions presented so much of their Report on the late Exhibition, as refers to the specimens of velvet and gold stamped paper hangings, by Messrs. Howell & Brothers, of Philadelphia, for which they recommend the award of the Gold Medal. And, also,

To the specimens of mousseline de laine, by the Manchester Print Works, of New Hampshire, and the gas fixtures, by Messrs. Cornelius & Baker, of Philadelphia, for which they recommend to each the award of a Recall Gold Premium.

On motion, the awards were made in accordance with the Report.

Fifty-nine resignations of membership in the Institute, were read and accepted.

Candidates for membership in the Institute (141) were proposed, and the candidates (6) proposed at the last meeting were duly elected.

Prof. John F. Frazer announced the death of Mr. Owen Evans, and offered the following resolutions, which were seconded by John E. Addicks, Esq., and unanimously adopted:

Resolved, That the Franklin Institute has heard with great regret, the announcement of the death of their late fellow-member, Mr. Owen Evans.

Resolved, That as a member of this Institute of twenty-four years' standing; for fourteen years an active member of its Committee of Exhibitions, and of its Board of Managers, he always commanded the admiration of his fellow-members for his zeal and energy, and endeared himself to them by his amiable manners.

Resolved, That the Corresponding Secretary be directed to communicate to the family of the deceased, the expression of our sympathy in their affliction.

Nominations were made for Officers, Managers, and Auditors of the Institute for the ensuing year.

On motion, it was

Resolved, That the polls for receiving the votes of the members of the Institute for Officers, Managers, and Auditors for the ensuing year, at the Annual Election to be held on Thursday, Jan. 21st, 1859, shall be opened at 3½ o'clock, and closed at 8 o'clock, P. M., and that seven members be appointed by the President a committee to receive the votes, and report the result thereof.

Messrs. Field & Hardie furnished one of Mr. L. C. Stephens' "Patent Combination Rules," a full description of which will be given in the *Journal* for next month.

Mr. G. Curtis exhibited a patent Horse Hoe, the invention of Mr. Lorin Wetherill, of Worcester, Mass. It is designed for hoeing corn, potatoes, cotton, or other field crops that are grown in rows or drills; and is adapted to the condition of the plants in any stages of their growth. It consists principally of a double mould-board plough, having at its rear sides two sets of hoes or paddles, affixed to the ends of arms that rotate in planes perpendicular to the furrow made by the plough. Motion is given to these arms by shafts driven by gearing moved by a wheel running upon the ground just in advance of the plough. The shafts can be raised or lowered at the ends carrying the hoes, in order that a lesser or greater quantity of earth may be thrown by them upon the hills surrounding the roots of the plants. The clods are broken by the hoes into small pieces, which consequently lay more closely about the roots.

It is claimed to be an efficient and labor-saving machine, hoeing as much ground in one day as the draft animals can pass over.

BIBLIOGRAPHICAL NOTICES.

The Coast Survey; its Costs, Abuses, and Power. From the New York Times.

The pamphlet before us with the above title, contains a violent attack upon the Coast Survey, or rather upon its superintendent; but the malice and personal spite of the writer is so marked upon every page and almost every paragraph of it, that were it to meet the eyes of intelligent men only, it would scarcely merit a notice in reply.

From the character of the writing, however, and the great exertions which have been made to distribute it wherever it might do harm, it is evidently intended to furnish a pretext, rather than a reason, for an attack upon this important work, and the silence of those who know its falsity, was not improbably one of the elements calculated on to secure its success.

Fortunately, our duty does not call on us to follow the writer in his

mere personal abuse ; the fact which underlies this very pamphlet, the great personal popularity and influence of Mr. Bache, and his position as a formidable opponent to all who have other purposes to serve than those of science and patriotism, is a quite sufficient answer to all this: let us turn to what, we will, by courtesy, call the *argument* of the pamphlet.

Reduced to propositions, it appears to be, that the Coast Survey is a very costly work; much more so under Mr. Bache, than it was under Mr. Hassler ; that it employs a great number of persons; and that the Superintendent is at the same time a member of the Light House Board; a Regent of the Smithsonian Institute, and an influential member of the American Association for the Advancement of Science.

The inference which the anonymous author would willingly have his readers draw from all this is, that Mr. Bache abuses his influence for his own personal ends, or for the advancement of his friends, but as this is nowhere distinctly alleged, and especially as no specific cases of such action are brought forward, we may pass such inference by for the time; certain that when any attempt is made at such allegations and proofs, their utter falsity will be abundantly demonstrated, and perhaps a righteous lesson be taught to anonymous libellers.

The Coast Survey is undoubtedly an expensive work, and it was the duty of the Government before instituting it to satisfy itself that the benefits to be derived from it were commensurate with its probable expenditure; and it is the duty of Congress now, to be satisfied that every dollar which is appropriated to it, is necessary for the attainment of these benefits. That this has been the case heretofore, any reference to the Congressional documents and the debates, all of which, notwithstanding the implied statement of this pamphlet, are accessible to any one who desires to be informed on the subject, and especially to any one residing in a city or town where there is a public library of any importance, will show.

In one of his early reports, the present Superintendent submitted to the Government, two alternatives ; the continuance of the survey on the scale which had been adopted up to that time ; and its enlargement, and consequently an increased annual expense; and he pointed out, that the latter plan would, by hastening the completion of the work, and allowing it to be carried on at all seasons of the year, be the more economical in the end; besides fulfilling more perfectly, the practical purposes for which the Survey was originated and maintained.

The Secretary of the Treasury and the Committees of Congress, and all subsequent Secretaries and Congresses were convinced that he was right; the scale of the Survey was enlarged, and when it became important, if not absolutely necessary, to put our Pacific Coast also under survey, a large additional expenditure was at once and with great unanimity granted. There has probably never been a great policy in our country which has met more general approbation from statesmen of all parties, and of all sections of the country, than this. And the few exceptions, (and our pamphlet makes the most, of the only distinguished one, that

of Mr. Benton,) are easily understood by those who know the circumstances, and can hardly make an offset against the overwhelming favorable opinions. We infer from this, that inasmuch as, every year, the accounts of the Coast Survey have been submitted to examination, by able men of all the political parties, and of the most varied shades of personal opinions and influences, and since no charge has ever been heard of the smallest misapplication of the moneys, either from political or personal favoritism, we infer justly and inevitably, that each successive Congress, from the time that the present Superintendent took charge until the present, has been satisfied that the moneys appropriated have been honestly and judiciously applied to the purposes for which they were intended. But it is perfectly proper that every citizen of the United States should satisfy himself on the fundamental points of this matter; and, since the expenditures are necessarily heavy, answer for himself the questions; are the benefits derivable from the Survey such as to compensate for its expense? and can these benefits be secured with less outlay?

Now the chief motives which led Mr. Jefferson to propose, and have since led his successors to maintain the Coast Survey, are, as we take it, as follows:—

That we have an extensive sea-coast, and one of a very dangerous character: lying in such a position in reference to our commerce, as to make it a lee-shore for at least one-half of the prevailing winds; low, abounding with shoals, and subject to violent storms. Yet along this coast the whole of our internal commerce is compelled to pass, at all seasons of the year, and under every disadvantage: while, from the peculiar position of our principal ports, our foreign commerce is subjected to scarcely less danger. But commerce is one of the principal industries of our country, and one which it has always been the obvious policy of our Government to protect and encourage. An accurate survey, and abundant and good charts of this dangerous coast are therefore a national necessity; and the least inquiry will satisfy any dispassionate mind, that the actual pecuniary benefit of the Coast Survey, as represented by valuable cargoes saved, and a diminished rate of insurance rendered possible by its labors, would, in a single year, re-pay almost the whole outlay upon it since its commencement. And not only our merchants and the inhabitants of the coast, but every dweller in the land participates in this benefit, since such improvements present themselves to him in the diminished price of goods, and more easy communication with foreign countries.

Again, it is the interest of every industrious dweller in the land, that the capabilities, facilities, and difficulties of every port upon our coast should be thoroughly investigated and widely published, and this can be done only by accurate surveys made on the same plan, and all the appliances which an extensive operation can give.

And, finally, while we encourage emigration from abroad, and hold out inducements to millions of industrious men and their families to leave their own homes to give us strength and importance, it is a duty which we owe to the community of civilized nations, and one which is

enforced by all the considerations of humanity, to publish and diffuse as widely and rapidly as we can, accurate charts of the approaches of a coast which is known as one of the most dangerous in the world.

Indeed, so forcible are the pleas for the Coast Survey, that even our author does not directly attempt to undervalue its importance, but pleads only for the discharge of the present Superintendent, which action would doubtless answer all his purposes. But to this proposition there are some serious objections.

In the first place, the peculiar practical features of this Survey, those which give it its greatest value, to wit: the vast extent over which its examinations are extended at the same time, and the rapid publication of its results, are due entirely to Mr. Bache, and have never before been attempted in any similar survey. The late Mr. Hassler, who was an excellent and competent man, evidently regarded his survey rather in the light of a scientific problem, than as a work of practical importance to our country. Hence, his work was performed leisurely, and by a few parties; and hence, when he died in 1842, even his primary triangulation had not extended beyond Rhode Island on the East, and the shores of Delaware Bay on the South, and not a map had been published. In the fifteen years which have elapsed since then, under Mr. Bache's supervision, "the reconnoissance has been extended over 40,000 square miles; 8 primary and 41 secondary base lines have been measured; 30,000 square miles of primary triangulation have been executed; 15,000 miles of shore line surveyed by the plane table; the positions of 5000 points determined; 3,500,000 soundings made; 1400 manuscript maps executed. The record of triangulation fills 600 volumes; and of astronomical observations, 460 volumes; the record of computations, 800 volumes, and of tidal observations, 1200 volumes; 345 electrotype plates have been executed; 280 preliminary charts and sketches, and 52 finished maps published, and 90,000 copies of the same distributed."

This, it will be observed, is quoted from a report to which the author of our anonymous pamphlet, as well as any other inquirer, has access, and from this it appears that, while the average yearly expenses of Mr. Bache's survey, exceed those of Mr. Hassler in the ratio of 4 to 1, the amount of work done is greater in the ratio of 7·3 to 1, showing an economy of 27 per cent. in favor of the present method of conducting the survey.

Do not let us be understood in this comparison as underrating or reflecting on the labors of Mr. Hassler: he was an upright, laborious man, and an excellent Superintendent. Some of the work above enumerated was not possible in his day. But what we want to show is, that he has had a worthy successor: nor do we hesitate to affirm that if we should by any chance lose the services of Mr. Bache, it would be impossible to replace him in this country, (or, as we believe, in any other.) If Mr. Everett ever said, (and we want better evidence of it than our author's assertion,) "that the entire work is one of practical astronomy," he made a very great mistake. Besides a practical astronomer, it requires a physicist of high power, a surveyor, a mechanic,

and above all, a governor; one who can appreciate the work which his subordinates are doing—can applaud judiciously the merits, point out the defects, suggest remedies, counsel experiments, and inspire every one with zeal and energy to work.

Now let us look at the second question. Can these results be obtained with less expenditure? The only mode of judging of this, by the majority of men, must be by comparison with similar works executed in other countries, and we again refer to documents which are accessible to every one, for our data of comparison.

According to the pamphlet which we are examining, our Coast Survey cost, while under Mr. Hassler, from 1807 to 1842, $730,900, and under Mr. Bache from 1843 to 1858, $4,321,110; in all, $5,052,010; and it appears that Mr. Bache employs 68 subordinates.

"The trigonometrical survey of Great Britain and Ireland was begun in 1791, and had cost, up to 1856, $12,000,000; and it is estimated that $8,000,000 will be required for its completion. The whole number employed on the survey in 1840, was 3500. The hydrographic surveys of England have cost, in the last twenty years, $10,000,000; the average number of persons employed yearly in these surveys is 1500."

(It will be remembered that our Coast Survey includes the hydrography).

" The surveys of France have been in progress nearly 100 years. The length of the Coast of France is about 600 miles only, and its survey required 28 years for its completion. The cost of the hydrography of France, alone, since 1854, has been, $4,300,000."

These examples of the two great commercial nations will probably suffice. It shows the comparative rapidity and economy of our survey, and the testimony of their scientific men, as well as of our own, will establish its accuracy.

We claim, therefore, to have vindicated the Coast Survey from the unfounded calumnies of the author of this anonymous tract. We have no time to allude to the Light House Board, &c., except merely to remark: That if the Government, exercised as it has been since Mr. Bache's residence at Washington, by all political parties, and by individuals who were bound to him by no ties of relationship, or personal friendship, have thought it expedient to use his talents and industry, in perfecting that portion of their administration where scientific knowledge is necessary, they have, we think, done well, and we hope they will continue to do so in future.

Whenever Mr. Bache is found guilty of perverting his position for political or personal purposes, he will sink nearer the level of anonymous writers, and their attacks may do him more harm.

To show the different estimate which foreign men of the highest character, and competent to judge of Mr. Bache's labor, put upon his work, we subjoin an extract from the address of Sir Roderick Impey Murchison, on presenting the Victoria Gold Medal to Mr. Bache. And when an English Society bears testimony to an American man of science in such terms as these, you may believe them. F.

"Operations of this nature will of course have been made available for a correct delineation of all the surface of the interior; for it is manifest that every triangle referable to a known unit furnishes three decided bases with which others may be connected in any direction, as long as there remains a *terra firma* for the instruments to stand on; but these internal operations, being more of a domestic nature, do not appear to the Council to establish any distinct claim to the medal. The case, however, is very different when we come to consider the accurate delineation of such a coast as that of the United States, commencing at the State of Maine, comprising no less than eighteen States on the Atlantic and Gulf of Mexico, besides others on the Pacific, and extending, as we are credibly informed, over not less than 30,000 miles. This number no doubt includes all the windings and indentations of the coast, and the interiors of its harbors, the islands, &c.; for it is to be remarked that, by the especial provision of the Government of America, the duty is not confined to one class of persons, but is shared equally by military and naval men and civilians, all chosen for their fitness; whereby not only is the field for selection vastly expanded, but a greater facility of correctly taking soundings and delineating shoals, harbors, and isolated rocks, is afforded.

"It would be impossible to do justice to an extensive work of this sort on an occasion like the present; but as the previous reports of this celebrated Coast Survey, from 1844 to 1845, inclusive, are in our library, those of our associates, and of the public generally, who wish to form an estimate of their value, can do so at their leisure, and they will see how vastly our medallist has pushed on this great work. *They will assuredly then rise from the examination with the thorough conviction that, whether we regard the science, skill, and zeal of the operators, the perfection of their instruments, the able manner in which the Superintendent has enlisted all modern improvements into his service, the care taken to have the observations accurately registered, his modest and unpretending demeanor, or the noble liberality of the Government, tempered with prudent economy. all unprejudiced persons must agree that the trigonometrical survey of the United States of America stands without a superior.*

"What, then, are we to say respecting the accurate delineation of this immense tract of coast, so much frequented by commerce, so important in every point of view to mankind at large, but that it is a great and universal boon conferred on all the inhabitants of this globe? We all benefit by the security of navigation: it is not the Government of the United States of America alone which derives an exclusive advantage from this admirable series of operations, but those who have most frequent access to the shores of the Atlantic and Pacific chiefly participate therein; and as Great Britain stands foremost amongst these, on whom can we so deservedly bestow one of our two royal gold medals this year?

"The grounds for making the award of the highest distinction which it is in our power to confer have been expressed in the terms sanctioned by the Council; but that document does not allude to other great qualities of a man who, besides his admirable Coast Survey, has so largely extended our knowledge on various subjects of scientific importance. I may here cite his delineation of the iso-magnetic curves both in Europe and America; his littoral and deep-sea soundings, which, it is believed, will soon enable us to read off the natural history of the Gulf Stream, and to calculate the periodicity and perturbations of the tides at given spots; and his many ingenious inventions, including a method of registering the pulsations of distant earthquakes."

The U. S. Naval Astronomical Expedition to the Southern Hemisphere, during the years 1849–1852.

At the suggestion of Lieut. J. M. Gilliss, L L. D., and under the influence of strong recommendations from the American Philosophical Society, at Philadelphia, and the American Academy of Sciences, at Boston, Congress authorized the fitting out of an expedition to South America; the principal object of which was to test the value of a new method proposed by Prof. Gerling of Marburg, for determining the distance of the earth from the sun, which is the fundamental unit of all astronomical measures; but as to the value of which various serious doubts exist, owing to the fact that the determination rests upon

observations of a phenomenon (the transit of Venus,) very difficult to observe with the required accuracy, and happening but once or twice in a century. The discussion of the observations of 1761 and 1769, by Encke, led to a determination of 95,360,000 statute miles for the mean distance, and this has been generally accepted, for want of a better value. Very serious doubts have, however, always been entertained of its correctness, for many of the observations, and some of the most important of them, were unsatisfactory; and since no transit of Venus will again occur until 1874, and this, and those following for more than a century, will be unfavorable for the determinations wanted, Prof. Gerling proposed a mode to attain the same object by observations of the planet Venus, when nearest the earth, made simultaneously at two observatories, nearly on the same meridian, and as widely apart as possible in latitude. These observations, as we have said, the U. S. Government undertook to have made here, and at Santiago, in Chile; and excellent instruments were procured, the expedition organized, and Lieut. Gilliss, with three officers of the Navy, who volunteered, as his assistants, were sent out to make the observations.

As they proposed a prolonged stay in Chile, for the purpose of observing at two consecutive returns of Venus to inferior conjunction, it was, of course, intended to occupy the intervening time by observatoins astronomical, and others; especially in observing the planet Mars when nearest the earth, for the same purpose of determining the earth's distance from the sun (which had already been attempted, but with unsatisfactory results), and making a catalogue of the fixed stars of as large a portion as possible of the Southern Hemisphere.

The results of this expedition, which possess a very high scientific value both from their nature and the known competency of the superintendent, have been published by Congress in five well printed quarto volumes. The third of these contains the observations on Mars and Venus, with their discussion and reduction by Dr. B. A. Gould, Jr.

Unfortunately it has happened, how we cannot explain, that while so much pains and so much money was spent, and laudably spent, upon this expedition, the corresponding observations in the United States, which were essential to its success according to the method proposed, were almost entirely neglected; so that while we have from Chile an excellent set of observations upon 217 days, extending over nearly 3 years, we have to compare with them in all but 24 observations made in the United States, and 4 at Greenwich (England). And of these 28, but 8 were upon Venus, the planet especially selected as giving by far the best data for the problem; and these only corresponding to Lieut. Gilliss' first series; for his second series, to make which he remained so long abroad, not a single corresponding observation is to be found in the United States. How this has happened is not explained, yet nothing appears to require more candid explanation. Before the departure of the expedition, a circular was issued by Lieut. Maury, the Superintendent of the Washington Observatory, which is under the control of the same department of the government, under whose auspices Lieut. Gilliss was sent out, calling on all friends of astro-

nomical science in the United States to co-operate in promoting the objects of this important expedition. Yet, with a number of well furnished observatories in our country, we get nothing but this poor response, and the whole expedition is allowed to fail, for fail it did, in its main purpose. The method of Prof. Gerling remains untested; and although we have a new determination of the parallax, thanks to the consummate skill and industry of Dr. Gould, it rests on comparisons which are not sufficient to give it authority against the previous determination of Encke, from which it differs by a material amount.

Of course, if the independent observatories did not choose to enter into this scheme, nothing farther can be said. We may regret their want of national spirit, and see plainly that they are not governed by scientific aspirations, but farther we have no right to go. But the government who fitted out this expedition, have two observatories, one at Washington, under the control of the Navy Department, and one at West Point, attached to the Department of War. What were they doing? Was Venus visible but five nights during the period for corresponding observations? or did other still more important duties (we cannot imagine such,) prevent them from doing their share? If this be so, why is not the explanation made in the report, that the reproach which now rests upon us may be taken away? One or two additional observers, if necessary, might and ought to have been placed at each competent observatory in the United States, that the pompous language of the report in Congress about our "American contributions to science," might have been sustained. As it is, we occupy a worse position than if we had never undertaken the expedition.

Great credit, however, is due and should be given to those who were actively engaged in this matter, and especially to Lieut. Gilliss, for his zeal in its inception and carrying out, and his skill in observing, which becomes evident from the discussion of the observations. To Mr. Gould, who, for the ability and labor displayed in doing the best he could with his materials, the thanks of scientific men are due. It will be hard, indeed, if his capabilities as an astronomer are doubted when he has such a demonstration of them to produce.

His result is, that "the sun's equatorial horizontal parallax" (at his mean distance from the earth), is $8{\cdot}5''$, being less by $0{\cdot}07''$ than the value commonly adopted, and corresponding to a distance of 96,160,000 statute miles from the earth. F.

The Mathematical Monthly. Edited by J. D. Runkle, A. M., Cambridge. John Bartlett.

Such is the unpretending title of a new Journal devoted to science, of which the first three members have reached us. Its objects as declared in the introductory note, and in the prospectus which announced the intention of establishing it, are the advancement of science and the elevation of the standard of mathematical learning in this country. It proposes to accomplish these, by the proposal of problems suited to all

grades of students in mathematics, from the beginner, who feels for the first time the desire to exercise his newly acquired sense, to the veteran, who wishes to test his own mature powers, or try the strength of his competitors by a friendly challenge, or to communicate to the world the results of his studies; and by the publication of "all scraps of mathematical writing too good to be lost, whether elementary or profound, whether original in manner or matter, whether complete in themselves, or to be resumed at the convenience of the author;" as well as of "carefully elaborated essays." In addition, the editor submits this proposal, which, if it meet with the attention which it deserves, will be of vast importance to the progress of science amongst us. "All mathematicians know that there are many subjects in the higher departments of the sciences upon which, little, if any thing, has as yet been written among us. Now, if they will take these subjects and develop them fully and systematically through the pages of the Journal, they may afterward be issued in a separate form from the stereotype plates, at a very small cost. In such cases, the right and benefit thereof shall vest in the author."

It requires no argument to show that a periodical conducted in accordance with these views, is much wanted in this country, and that, if ably supported, will be of the greatest benefit to our science. As to the ability with which it is likely to be conducted, the character of the editor, and the list of names of those who have promised their active support, including, as it does, those of our most eminent men in this branch of science, and of almost all of them, is more than a sufficient guarantee.

To those whose experience has taught them to rely less on things promised than on those performed, an examination of the three numbers already published must prove satisfactory.

They have already given us a number of ingenious and useful suggestions of problems suited to various degrees of mathematical ability; but the gem of the collection, is an account of the late great comet, (1858, V. Donati,) as it appeared in the great Equatorial Telescope at Cambridge, contributed by G. P. Rand. The value of this paper as a contribution to our knowledge of the nature of comets cannot well be overrated, and, although in no wise mathematical in its form, it is worth close investigation by the mathematician as giving requisite data for his researches.

The appearance of this Journal is in all respects worthy of its other high merits. The form is convenient, the type excellent, the page handsome, and the plates illustrating the appearance of the comet, worthy of high praise for their artistic excellence.

Let every one who reads our notice take pains to satisfy themselves that we are not exaggerating the praise deserved.

We hope that the enterprise may prove successful. It is highly honorable to Mr. Runkle to have attempted this thing, it will be discreditable to our country if it does not succeed. Should its success equal its merits, both the editor and the country will have cause to congratulate themselves. F.

Abstract of Meteorological Observations for October, 1858; *made in Philadelphia, Somerset, Bedford, and Huntingdon Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.*

October, 1858.	PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer. Barometer. Mean.	Barometer. Mean daily range.	Thermometer. Mean.	Thermometer. Daily oscillation.	Thermometer. Mean daily range.	Relative humidity. 2 P. M.	Force of vapor. 2 P.M.	Rain.	Prevail'g winds.	SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer. Bar. Mean.	Ther. Mean.	Relative humidity. 2 P. M.	Force of vapor. 2 P.M.	Rain.	Prevail'g winds	BEDFORD, Bedford Co. SAMUEL BROWN, Observer. Bar. Mean	Ther. Mean.	Prevail'g winds.	HUNTINGDON, Huntingdon County. JACOB MILLER, Obsr. Bar. Mean.	Ther. Mean	Rain.	Prevail'g winds
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.		Inch.	°	Per ct.	Inch.	Inch.		Inch.	°		Inch.	°	Inch.	
1	29·617	·135	65·3	20	8·0	75	·572	0·025	(var.)	27·538	55·7	91	·429	0·316	WNW	28·937	62·3	N W.	29·103	61·7	0·249	N W.
2	29·850	·234	60·0	20	5·3	36	·262		WNW	27·708	54·3	51	·348		W.	29·166	56·7	N W.	29·318	53·7		N.
3	29·682	·168	69·3	30½	9·3	47	·486		S W.	27·535	70·0	54	·536		WSW.				29·088	66·3		W.
4	29·590	·092	77·3	25	8·0	33	·462		WSW.	27·502	71·3	50	·499	0·098	W.	28·873	76·0	S W.	29·048	77·0	0·080	W.
5	29·875	·285	65·7	13	11·7	34	·265		N W.	27·730	57·0	62	·355		(var.)	29·173	58·7	N W.	29·381	59·7		N.
● 6	29·967	·119	60·7	16½	5·0	37	·244		(var.)	27·726	54·0	79	·386		(var.)	29·218	55·7	S E.	29 398	56·7	0·376	S.
7	29·487	·481	64·5	12	3·8	89	·591	0·257	S W.	27·369	58·7	59	393	0·453	W.	28·785	63 0	(var.)	28·938	61·7	0·060	W.
8	29·565	·141	52·0	21¼	12·5	24	·126	0·030	W.	27·410	43·3	59	·220		W.	28·845	50.7	N W.				W.
9	29·698	·134	52·7	20	2·0	35	·189		S W.	27·583	42·7	69	·214		W.	29·029	47·0	N W.	29·284	49·7	0 062	N.
10	29·992	·294	56·0	21½	3·3	40	·258		W.	27·808	46·7	64	·308		N W.				29·501	48·3		N.
11	29 994	·028	56·8	12	4·8	54	·282		(var.)	27·753	52·7	48	·300		S S E.	29·214	57·7	S W.	29·422	55·7	0·104	(var.)
12	29·966	·054	58·7	13	1·8	57	·327	0·277	N E.	27·681	54·7	82	·426	0·250	S E.	29·157	52 0	S E.	29·361	54·3	0·432	S E.
13	29·764	·202	64·8	12	6·2	84	·577	0·238	S W.	27·604	54·3	82	·442		WSW.	29·039	59·7	S W.	29 192	57·7		S.
☾ 14	29·771	·068	58·3	14	6·5	46	·255		S W.	27·646	46·0	51	·201		W.	29·100	53·0	N W.	29·264	55·0		W.
15	30·034	·263	55·2	19	4 2	38	·228		W.	27·853	48·7	54	268	0·032	W.	29·310	51·3	N W.	29·539	49 3		W.
16	30·221	·187	58·7	25¼	3·5	40	·292		(var.)	27·999	54·0	41	·326		WSW.	29·470	54·7	S W.	29·680	50·7		W.
17	30·290	·069	62·0	23	3·3	46	·376		S W.	28·064	58·7	53	·455		S W.				29 700	55·3		S.
18	30·256	·038	60·0	22	2·0	61	·448		S W.	28·039	59 3	52	·469		S.	29·472	58·7	S W.	29·663	55·3		S.
19	30 113	·143	62·3	20½	2·3	58	·455		S W.	27·896	59·0	50	·408		S.	29·341	60·3	N W.	29·549	56·3		S.
20	30·003	·110	63·5	25	3·2	56	·483		S W.	27·785	62·0	62	·488		S.	29 243	59·7	(var.)	29·420	58·7		S.
21	29·997	·072	60 2	16¼	7·0	73	·451		N E.	27·799	62·0	57	·435		(var.)	29·246	63·3	S E.	29·435	61·7		S.
○ 22	29·927	·117	57·3	6	3·5	88	·422	0·066	N E.	27·745	58·7	65	·462		W.	29·183	57·0	S.	29·368	59·7		S E.
23	29·769	·158	62·3	14	5 0	83	·516		N E.	27·690	50·3	57	·327		N W.	29·115	58·0	N W.	29·294	56·7		N.
24	29·772	·068	56 7	18	5·7	50	·291	0·012	(var.)	27·711	46·3	70	·287		(var.)				29·384	52·0		N.
25	29·989	·216	49 5	17	7·2	26	·127		N.	27 799	46·0	73	·295		(var.)	29·243	47·0	N W.				(var.)
26	30·081	·109	46 3	19	4·2	32	·133		N N E.	27·816	44·0	47	·183		S S E.	29·323	44·3	N W.	29·544	40·0		S E.
27	30 053	·045	50·8	27	4·5	32	·175		N E.	27·835	43·3	49	·205		S E	29 333	42.0	E.	29 561	38·7		S E.
28	30·086	·034	55·0	35	4·2	31	·202		N.	27·843	47·0	64	·262	} 0·609	S.	29·334	47·3	S E.	29·553	45·0	0·338	S E.
☽ 29	30·041	·057	56 5	10	6 8	88	·422	0·699	N E.	27·727	48·7	86	·322		S E.	29·237	51·3	S E.	29·416	50·7	0·259	S.
30	29·790	·251	63·5	10	7·0	89	·569	0·174	S.	27·630	53·0	77	·412	0·008	WSW.	29·064	56·3	N W.	29·225	54·7		S.
31	29·846	·076	62·3	17	3·2	56	·397	..	S W.	27 698	49·0	64	·308	0·290	WSW.				29·380	51·7		N.
Means	29·906	·143	59·5	17	5·3	53	·351	1·778	s 84¾ w	27·725	53·4	62	·354	2·056		29·171	55·5		29·393	56·9	1·960	

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FEBRUARY, 1859.

CIVIL ENGINEERING.

*Canals and Canal Conveyance.** By W. O'Brien, C. E.

[Extracts from the Prize Essay on Canals and Canal Conveyance for which a premium of £100 was awarded by the Canal Association.]

(Continued from page 26.)

It has often been argued that large and deep canals offer more resistance than those with a small sectional area. Granting this to be true (and in our present state of knowledge of hydraulics the fact has to be verified), we find that this argument in favor of maintaining the old dimensions loses much of its importance when we consider that all canals are frequented by boats drawing various depths of water: now, on the other hand, the power of increasing at any time the size and draft of water of boats is of great importance. Then as to steam towing in particular, every one knows that steam engines cost less per H. P. the larger they are, and that no more men are required to work a 200 tons steamer than to work one of 100 tons. Besides, steamers traveling much faster than boats tracked by horses, would probably require a little more room for crossing each other without stopping the engines.

The widening of the pounds is not of so much importance as that of the locks, because the former can be done gradually and according to the wants of navigation (where traffic is not very brisk the width should be calculated for a single boat with occasional sidings), whereas, the latter is an expense which cannot be divided. To be accessible to trains

* From the Lond. Civ. Eng. and Arch. Journal, Oct., 1858.]

of boats, as on the Severn navigation, they should have the length of the longest train, and at least three pairs of gates, more if water is scarce, so as never to draw from the upper pounds more water than that strictly sufficient for navigation. It is needless to say, then, it takes no more water to pass two or more boats at a time than separately.

Supposing it to be granted that a wider sectional area and enlargement of locks are necessary, it becomes evident that the supply of water must be considerably increased, or else means must be found for diminishing the expenditure, principally that due to lockage.

The first object can be attained, 1st, by deepening the cuttings at the summit levels; 2d, by increasing the dimensions of reservoirs; 3d, by artesian borings (Kind's system is the best) properly and carefully applied; 4th, when these means fail to bring water to the requisite height in sufficient quantity, recourse must be had to machinery: the Cornish engine must be applied,—it is in most cases the best.

The second object, that of diminishing the expenditure of water, can only be attained by two means: either suppressing locks altogether, and having recourse to machinery for raising or lowering boats from one level to another; or by restoring to each lock the quantity taken out of it for the passage of each boat.

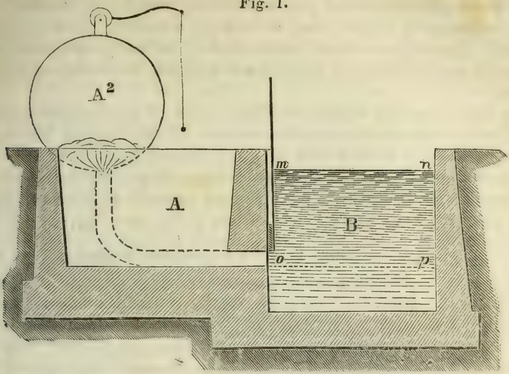
Inclined planes require machinery of the most expensive description, and can never work cheaply, because the machinery has to develop great efforts at a given time. Generally, engines used intermittently give a bad result, because a great deal of steam is wasted, and because they must be made on large dimensions. When the same work can be done gradually, a smaller engine answers the purpose. This is probably one of the reasons why locks have been maintained in preference to inclined planes, even in cases where it has been found necessary to raise water for lockage at a height varying from 50 to 70 ft., as in the case of the Ering summit level. If I were to advocate any mechanical mode of raising boats from one level to another, I would suggest the hydraulic press.

If a reservoir A, or a second lock, be made next to the one in use, B, Fig. 1, with a sluice at S, to open or shut off its communication with B, it will enable one to save half a lockfull; for supposing $m\,n$ and $o\,p$ to be the level of the water in the upper and lower pound, if we want a boat, say to go down, we shall open the sluice at S and turn out the water remaining in the lock into the lower pound; we shall thus have half a lockfull ready for an ascending boat.

I now come to a recent invention of a French engineer, M. Andraud, for restoring the water momentarily abstracted from the lock for the passage of each boat. With M. Andraud's invention, we save the entire lockfull, instead of half, as in the preceding case; for reservoir A^2, instead of being open, is shut in and air-tight, and communicates with an air-pump, which rarefies the air in A^2 till all the prism of water in $m\,n\,o\,p$ is introduced into A^2. To the air-pump may be substituted a small coal fire; I believe it is this system which was originally proposed by the inventor. This seems a really practical invention.

An important object of consideration is the loss of time in passing from one lock to another. Wherever the supply of water is sufficient, let locks be made as deep as possible, so as to reduce to a minimum the number of locks necessary for a given total fall. I see no reason

Fig. 1.



for giving the lower locks the same dimensions as the upper ones; let them be larger if they can easily be supplied with water. Signals should be used to warn the lockmen at the approach of boats; double locks should be preferred, although they cost more; the openings for admitting water should be larger.

If it is allowed that a large sectional area is necessary, then it is evident that too much importance cannot be given to river navigation. I much doubt whether it was a right step to establish several miles of canal parallel to rivers—as the Kennet and Avon Canal parallel to the Kennet, the Rhone au Rhin Canal parallel to two rivers (the Rhine and the Ill), &c.—instead of improving the bed of the rivers themselves, and simply shortening the distances by cuts avoiding the bends. It will be urged that the establishment of locks and weirs in some rivers would be very difficult; then let our endeavors, by all means, be directed towards improving this branch of hydraulic engineering.

There is no doubt that foundations in a large river, with strong current, are very expensive, but this part of the engineer's art has much improved since Brindley and Brisson. Persons interested in this branch of construction would do well to read the accounts of the Chester and Rochester bridges, the French and German works on the process known as "foundation sur encaissement."

It will be asked, what would be the expense of widening our canals, and applying some of the alterations proposed? That is impossible to say; but the alterations can be made gradually, and we can assign a limit to the expenditure. We can expend as much on the establishment of a canal line as is spent on the nearest parallel railway, and have nothing to fear from the latter; as the cost of conveyance, exclusive of general expense, is less on the canal than on the railway.

The object of canal or boat proprietors should not be to adapt the form and dimensions of boats to those of canals, or *vice versâ*, but rather to adapt both to a direct communication with rivers, harbors, and estuaries, in such a manner as to suppress, or at least to reduce to a minimum, all transfer of goods, avoiding thereby destruction of property, expense of loading and unloading, wharfage, agency, and loss of time. This object cannot be attained by the canal owners alone, but needs the co-operation of the inland and maritime conveyance companies.

The table annexed reduces to three types all the systems of machinery at present in use on screw steamers. M. Inshaw, of Birmingham, has built, for the Grand and Regent's canal, boats with two screws astern, one on each side of the rudder, revolving in opposite directions, and worked simultaneously by the same engine; these boats are said to be very good and to steer well when going stern on.

Different Systems of Steam Engines and Propellers.

One or two screws revolving rapidly and finely pitched.	High-pressure non-condensing locomotive engines, acting directly on the main shaft, two or four cylinders; cranks acting at right angles; lap and lead of slide valves; no special apparatus for expansion; tubular boilers and steam jet; pressure of steam as high as possible.	Very suitable for small boats.	If two screws are applied they should work in opposite directions, and the engines should be so disposed as to be easily disconnected in case of accident to one of the screws.	The hand gear, pressure gauge, &c., to be on deck; the boilers to be fed by a separate engine or donkey.
	Low-pressure condensing engines with expansion gear, multiplying beveled gear; air-pump worked by a crank or main shaft. Not necessary to have more than one cylinder.	A sudden jerk may break the beveled wheels, and thereby render the engines useless		
One or two screws with a coarse pitch revolving slowly.	Low-pressure condensing engines work'g directly on the main shaft; air-pump worked by a separate (?) engine; special apparatus for expansion: two or four cylinders with cranks acting at right angles.	. . . . . .		
Two paddles astern or in the middle.	Same as preceding; but the air-pump can be worked by a crank on the main shaft.	Not advocated		

As to ship canals, the mere inspection of a map will at once give an idea of the localities most favorable to works of such magnitude. Might not a line be found favorable for a direct ship navigation from Galway or Limerick to the German Ocean, thus avoiding the Channel? The Forth and Clyde estuaries have already been suggested by Mr. Macpharlane; a line from Newcastle to Carlisle, or from Hull to Liverpool, is perhaps feasible: it is proposed to make one from Southampton to the Thames. Ship canals are more frequently supplied from the sea itself; in that case the total fall is limited by the height of the spring tides.

In a description of boat which I propose for river and canal navigation, owing to the peculiar shape of the cross section, fine lines can be obtained underneath without much loss of space. The deck is scarcely tapered at the end, so as to give room for loading and unloading.

In the ordinary boat with two screws, the engine acts on the screw shafts by means of beveled gear, so that if the latter breaks down, which is a frequent occurrence, the engine is of no use. I propose that the engines work directly on the screw shafts, a strap connecting the two screws, but only to ensure regularity of working; if it breaks, the only effect will be that the engines will work separately.

Experience alone can show the best dimensions of boats and locks. If 90 feet by 15 feet were found to answer, it would save the necessity of rebuilding on larger dimensions a vast number of our locks; still when a lock is much out of repair, I would advise rebuilding on larger dimensions.

With such powerful means of conveyance as those afforded by railways on one hand, and coasting vessels—screw vessels in particular—on the other, we should be wrong in laying out large sums of money to maintain certain lines of navigation which do not present certain natural resources, and which do not allow, from the unfavorable circumstances in which they are placed, of conveying large quantities in a given time. I am convinced that the future prospects of inland navigation lie in improvement of our rivers, widening of our canals, and application of steam power to towing trains of boats. Except in a few rare cases, we cannot afford to maintain narrow canals; if it be too expensive to widen them, let them be turned to account as feeders to the wide canals, or for water works or agriculture; and the wide canals should be in immediate connexion with our seaports and docks.

This was written before I met with the following passage in one of the most remarkable works ever written, Flachat's "Projet de Canal Maratime de Paris au Havre:"

"Goods can be conveyed by sea more economically than by inland navigation. . . It follows, that even at greater distances seaports enjoy more means of exchange of produce between each other than towns in the interior, since they can communicate at less expense. . . Thus it is that the greatest commercial activity prevails in seaports, for trade extends according to the means of communication. Therefore it is evident that for the greatest good of the country, seaports

should enjoy the most ample means possible of putting the interior in possession of those commodities which can so easily be exchanged from one seaport to another. We can therefore establish as a principle, that a proper system of navigation ought to converge from the interior to the principal ports of the sea coast, and that it is easy to foresee that the most important lines of navigation will be those which join the most flourishing seaports to the towns where the manufactures are the most important or the consumption greatest."

Concluding Remarks.

The best way of proceeding with works is, first, to draw up a list of prices, and pay the builders according to valuation. The advantages are, that better workmanship and better materials are obtained; the builders can content themselves with a moderate profit, because they run no risks; when the works give dissatisfaction they can be stopped, and agreements made with other parties; and the owners are free to change their plans at any time;—or, secondly, combine the two systems, contract for that which is certain, a schedule of prices for what is uncertain.

The question of working expenses is more important in the present position of our canals. A canal may be worked in three different manners: it may be left open to all boats on payment of a toll; or the owners may find boats, steamers, horses, &c., and work them or a part of them at their own cost and risk; or they may make an agreement with a contractor for all or part of the traffic of the line.

The first system cannot very well be applied exclusively, at least by private individuals or companies; such a source of income would fluctuate too much in a great many cases. (When the owners are equally interested in the canal as a property, and in the traffic as a source of income, the canal is worked with more advantage, and the boats and canal are better adapted to each other, than when the interests are entirely separate.) The contract system may be applied here with advantage.

Supposing some of the improvements I have suggested to be carried out, it becomes a question how and where they are to be applied. A general increase of expenditure along a canal would perhaps be rather hazardous. I propose widening and improving our canals,

1st, In localities where a considerable traffic exists or may be expected, and in particular on lines perpendicular rather than parallel to railways.

2d, In the vicinity of harbors, docks, and navigable rivers, effecting as easy a communication with and between them as possible.

3d, Enlarging the pounds only where it can be done at a moderate expense, in other places leaving only room at present for the passage of boats one way, with occasional sidings, till an increase of traffic justifies further expenses.

4th, Rebuilding locks on larger dimensions only when they get out of repair.

5th, Buying property for extensions as soon as possible, particularly

where it can be done without compulsion, but without extending the works till the wants of an increased conveyance make it necessary. In the meanwhile the ground may be let, or otherwise made available.

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Inland Navigation on the Continent.

France.—Notwithstanding the numerous railways which are fast spreading over the country, and the handsome and commodious vessels which ply between the seaports on the coast of France (vessels built on eminently scientific principles, costing from 200 to 500 francs per ton, and conveying freights at very low rates), the traffic on canals and navigable rivers in France has been continually gaining in importance.

Competition seems to have excited the ingenuity of the engineers, as will be seen by some of the following innovations:

Verpilieux's paddle-boats are adapted to stemming the Rhone and other strong currents. The paddles are armed at the periphery with strong iron claws, like the flukes of an anchor, and can be raised or lowered without ceasing to be propelled by the engines. When raised they act in the ordinary manner; when lowered the claws strike the bottom, and a resisting fulcrum being obtained, the most rapid current may be stemmed.

The hydraulic car may be compared to an ordinary locomotive, with this exception, that the driving wheels are propelled by water-power instead of steam, the permanent way being composed of a railway and canal together. It may be useful in turning torrents to account for the conveyance of minerals or timber.

The "barrages mobiles" are simply movable weirs of a more or less ingenious construction. They serve to regulate the regime of a river, and to afford a downward passage to rafts of wood; the passing of such a place is not always void of danger. A description of M. Poirée's barrages ought to be read.

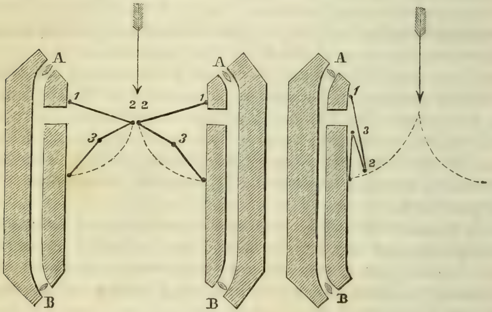
The "bateau Toneur" used on the lower Seine and the Oise is moved by means of a revolving drum on which passes a chain extending all along the bottom. It is used as a tug boat.

Fourneyron's sluice and lock-gate is an ingenious and completely practical invention which that eminent hydraulic engineer proposed some years ago for the weir and lock at the "Monnaie," Paris. Each gate is articulated at 1, 2, 3, (Fig. 2.) A conduit passes through the side wall, and connects the water above, below, and behind the gate. If A be opened and B closed, the water from the upper level fills the conduit, finds its own level behind the gate, and pressing on the panels 1, 2, and 2, 3, closes the gate. If we want to open the gate, we shall close A and open B; the water will run out into the lower level; the pressure above the gate will then be less than the pressure behind it, and it will collapse against the side wall as in Fig. 3. The two sluices A, B, are worked by the same lever, and are made to turn on a pivot, so that scarcely any effort is necessary to open or shut them. This invention has been found by repeated experimemts to be per-

fectly applicable to rivers and canals, whatever may be the difference of level.

Several descriptions of iron steamers, but all of a superior make, now run from Paris to Rouen, Havre, and London. They load and unload in Paris, at the "Cassin de la Vilette," passing by the canal St. Denis. They carry from 150 to 250 tons of freight, and have engines and propellers astern. The propellers are two paddles, one on each side of the stern-post, or one screw before the rudder, or two screws revolving in opposite directions. The Express boats are fine sea-going vessels, with two screws, and taffrail before the funnel. The

Fig. 2. Fig. 3.



"Paris et Londres" are auxiliary screw schooners, conveying cargo in one bottom from Paris to London in five days, including stoppages at Rouen and Havre. Most of these vessels are propelled by condensing engines. Steamers ply on most of the French canals, but steam haulage is seldom applied except on rivers.

Sweden.—The following is communicated to me by a friend, H. Parish, Esq., of New York:

"My opinion is that the application of steam to canal navigation has been more successfully carried out in Sweden than elsewhere; the steamers are all screw steamers, and travel at the rate of 9 to 10 miles an hour, excepting where the canal is narrow, and they are obliged to go at half speed to avoid washing the banks; the engines are small and compact; the cylinders are inclined, and rest upon a hollow bed-plate, which is the condenser; the air-pump and feed-pump are worked either by eccentrics on the main shaft, or directly from the cross head of the piston rod. The hand gear is on deck. This engine is almost universal in Sweden, and is well known, having obtained a medal at the French Great Exhibition. The vessels convey from 150 to 200 tons freight, and could tow several barges."

*On the Measurement of Water by Weir Boards.**

The following report, by JAMES THOMSON, A. M., C. E., Professor of Civil Engineering, Queen's College, Belfast, on the progress of experiments on this subject, was read before the Mechanical Section:—

The experiments proposed to be comprehended in the investigations to which the present interim report of progress relates, have for their object to determine the suitableness of triangular (or V-shaped) notches in vertical plates for the gauging of running water, instead of the rectangular notches in ordinary use. The ordinary rectangular notches, accurately experimented on as they have been, at great cost and with high scientific skill in various countries, with the view of determining the necessary formulas and coefficients for their application in practice, are, for many purposes, suitable and convenient. They are, however, but ill adapted for the measurement of very variable quantities of water, such as commonly occur to the engineer to be gauged in rivers and streams. If the rectangular notch is to be made wide enough to allow the water to pass in flood times, it must be so wide that for long periods, in moderately dry weather, the water flows so shallow over its crest, that its indications cannot be relied on. To remove in some degree this objection, gauges for rivers or streams are sometimes formed, in the best engineering practice, with a small rectangular notch cut down below the general level of the crest of a large rectangular notch. If, now, instead of one depression being made, for dry weather use, in a crest wide enough for use in floods, we conceive of a large number of depressions, extending so as to give to the crest the appearance of a set of steps or stairs, and if we conceive the number of such steps to become infinitely great, we are led at once to the conception of the triangular instead of the rectangular notch. The principle of the triangular notch being thus arrived at, it becomes evident that there is no necessity for having one side of the notch vertical, and the other slanting; but that, as may, in many cases, prove more convenient, both sides may be slanting, and their slopes may be alike. It is then to be observed that, by the use of the triangular notch, with proper formulas and coefficients, derivable by due union of theory and experiments, quantities of running water from the smallest to the greatest, may be accurately gauged by their flow through the same notch. The reason of this is obvious from considering that, in the triangular notch, when the quantity flowing is very small, the flow is confined to a small space admitting of accurate measurement; and that the space for the flow of the water increases as the quantity to be measured increases, but still continues such as to admit of accurate measurement.

Farther, the ordinary rectangular notch, when applied for the gauging of rivers, is subject to a serious objection from the difficulty or impossibility of properly taking into account the influence of the bottom of the river on the flow of the water to the notch. If it were practicable to dam up the river so deep that the water would flow through

* From the Journal of the Society of Arts, No 311.

the notch as if coming from a reservoir of still water, the difficulty would not arise. This, however, can seldom be done in practice; and, although the bottom of the river may be so far below the crest as to produce but little effect on the flow of the water when the quantity flowing is small, yet when the quantity becomes great, the "velocity of approach" comes to have a very material influence on the flow of the water, but an influence which it is usually difficult, if not impracticable, to ascertain with satisfactory accuracy. In the notches now proposed, of triangular form, the influence of the bottom may be rendered definite, and such as to affect alike (or, at least, by some law that may be readily determined by experiment) the flow of the water when very small, or when very great, in the same notch. The method by which I propose that this may be effected, consists in carrying out a floor, starting exactly from the vertex of the notch, and extending both up-stream and laterally, so as to form a bottom to the channel of approach, which will both be smooth and will serve as the lower bounding surface of a passage of approach, unchanging in form, while increasing in magnitude at the places, at least, which are adjacent to the vertex of the notch. The floor may either be perfectly level, or may consist of two planes, whose intersection would start from the vertex of the notch, and, as seen in plan, would pass up stream perpendicularly to the direction of the weir board; the two planes slanting upwards from their intersection more gently than the sides of the notch. The level floor, although theoretically not quite so perfect as the floor of two planes, would probably, for most practical purposes, prove the more convenient arrangement.

With reference to the use of the floor, it may be said, in short, that by a due arrangement of the notch and the floor, a discharge orifice and channel of approach may be produced, of which (the upper surface of the water being considered as the top of the channel and orifice,) the form will be unchanged, or but little changed with variations of the quantity flowing; very much less, certainly, than is the case with rectangular notches. The laws regulating the quantities of water flowing in such orifices as have now been described, come naturally next to be considered. Without, however, in the present interim report, attempting to enter on a detailed discussion of theoretical considerations on this subject, I shall here merely advert briefly to the principal results and methods of reasoning.

By theory I have been led to anticipate that the quantity flowing in a given notch should be proportional or very nearly so, to the $\frac{5}{2}$ power of the lineal dimensions of the cross section of the issuing jet, or to the $\frac{5}{2}$ power of the head of water over the vortex of the notch. This head is to be understood, in the case of water flowing from a still reservoir, as being measured vertically from the level water surface in the reservoir down to the vertex of the notch; or in the case of water flowing to the notch with a considerable velocity of approach over a floor arranged as above described, the head is to be considered as measured vertically from the water surface, where the motion is nearly stopped by the weir board at a place near the board, but as far as may be found

practicable, from the centre of the notch. The law here enunciated, to the effect that the quantity flowing should be proportional to the $\frac{5}{2}$ power of the head, I consider should hold good rigidly in reference to water flowing by a triangular notch in a thin vertical plate, from a large and deep reservoir of still water, if the water were a perfect fluid, free from viscidity and friction, and from capillary attraction at its surface, and from any other slight disturbing causes that may have minute influence on the flow, the flow being supposed to be that due simply to gravitation resisted by the inertia of the fluid. The like may be said of water flowing from triangular notches with shallow channels of approach, having floors as described above, when due attention is given to make the passages of approach so as really to remain unchanged in form for a sufficient distance from the notch, while increasing in magnitude as the flow increases (such being supposed according to my theory to be possible), and if due attention be paid to the measuring the heads in all cases in positions similarly situated with reference to the varying dimensions of the issuing streams.

In illustration of these statements, or suppositions, I would merely say, that, if two triangular notches, similar in form, have water flowing in them at different depths, but with similar passages of approach, the cross section of the two jets at the notches may be similarly divided into the same number of elements of area; and that the areas of the corresponding elements will be proportional to the squares of the lineal dimensions of the cross sections ; or, as from various considerations may readily be assumed proportional to the squares of the heads; also the velocities of the water in the corresponding elements may be taken as proportional to the square roots of the lineal dimensions, or to the square roots of the heads. From these considerations, supported by numerous others, it appears that the quantities flowing should be proportional to the products of the squares of the heads into their square roots, or to the $\frac{5}{2}$ power as already stated.

The friction of the fluid on the solid bounding surfaces of the passages of approach, where the water moves rapidly adjacent to the notch, may readily be assumed from all previous experience in similar subjects, not to have a very important influence even on the absolute amount of the flow of the water ; and if we assume (as is known to be nearly the case for high velocities, such as occur in notches used for practical purposes, unless usually small) that the tangential force of friction of the fluid per unit of area of surface flowed along, is proportional to the square of the velocity of flow, it follows by theory that the friction, though slightly influencing the absolute amount of the flow, will not, according to that assumption, at all interfere with its proportionality to the $\frac{5}{2}$ power of the head. And this condition will very nearly hold good if the assumption is very nearly correct.

How closely the theory thus briefly sketched may be found to agree with the actual flow of water, will be a subject for experimental investigation ; and whatever may be the result in this respect, the main object must be to obtain for a moderate number of triangular notches of different forms, and both with and without floors at the passage of

approach, the necessary coefficients for the various forms of notches and approaches selected, and for various depths in any one of them, so as to allow of water being gauged for practical purposes when in future convenient, by means of similarly formed notches and approaches. The utility of the proposed system of gauging, it is to be particularly observed, will not depend on a perfectly close agreement of the theory described with the experiments; because a table of experimental coefficients for various depths, or an empirical formula slightly modified from the theoretical one, will serve all purposes.

To one evident simplification in the proposed system of gauging, as compared with that by rectangular notches, I would here advert, namely, that in the proposed system the quantity flowing comes to be a function of only one variable, namely, the measured head of water, while in the rectangular notches it is a function of at least two variables, namely, the head of water and the horizontal width of the notch, and is commonly, also, a function of a third variable very difficult to be taken into account, namely, the depth from the crest of the notch down to the bottom of the channel of approach; which depth must vary in its influence with all the varying ratios between it and the other two quantities of which the flow is a function.

The proposed system of gauging also gives facilities for taking another element into account, which often arises in practice, namely, the influence of back water on the flow of the water in the gauge, when, as frequently occurs in rivers, it is found impracticable to dam the river up sufficiently to give it a clear overfall free from the back or tail water. For any given ratio of the height of the tail water above the vertex of the notch, I would anticipate that the quantities flowing would still be, approximately at least, proportional to the $\frac{5}{2}$ power of the head as before, and a set of coefficients would have to be determined experimentally for different ratios of the height of the tail water above the vertex of the notch.

With the aid of the grant placed at my disposal by the Association at last year's meeting, for the purpose of these researches, I have got an experimental apparatus constructed and fitted up at a place a few miles distant from Belfast, in Carr's Glen, on the grounds of Mr. Neeson, who has kindly afforded me all the necessary facilities regarding the water supply and the site for the experiments, and I have got some preliminary experiments made on a right-angled notch in a vertical plane surface, the sides of the notch making angles of 45° with the horizon, and the flow being from a deep and wide pool of quiet water, and the water thus approaching the notch uninfluenced by any floor or bottom. The principal set of experiments as yet made were on quantities of water varying from about two to ten cubic feet per minute, and the depths or heads of the water varied from two to four inches in the right-angled notch.

From these experiments I derive the formula $Q=0{\cdot}317\ H^{\frac{5}{2}}$, where Q is the quantity of water in cubic feet per minute, and H the head as measured vertically in inches from the still water level of the pool down to the vertex of the notch. This formula is submitted at present tem-

porarily, as being accurate enough for use for ordinary practical purposes, for the measurement of water by notches similar to the one experimented on, and for quantities of water limited to nearly the same range as those in the experiments; but as being, of course, subject to amendment by more perfect experiments extending through a wider range of quantities of water.

Out of the grant of £10 from the Association for these experiments, the amount for which I have hitherto had to apply to the treasurer as having been expended in them is £8 0*s.* 4*d.*, which leaves a balance remaining of £1 19*s.* 8*d.*

It will be readily observed that the experimental investigations indicated in the foregoing report as desirable, are such as would require for their completion and extension to large flows of water a great expenditure both of time and money, like as has already been the case with researches on the flow of water in rectangular notches. All that I can myself, for the present, propose to attempt is to open up the subject with experiments on moderately small flows of water; and with this view I would be glad to be aided by a further grant from the Association in continuing experiments of the kind already undertaken.

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*Experiments on the Substitution of Coal for Coke in Railway Locomotives.**

That the consumption of smoke in coal-burning locomotives may be accomplished in a satisfactory manner was proved by experiments made some time since by Mr. Joseph Beattie, the talented manager of the London and South-Western Railway Company. In this case the invention made use of has received the approval of competent judges, and it has been patented, but it is stated there is one objection to its general employment. An expenditure of about £300 is required to adapt it to any engine previously in use, and on this account its employment has been confined to the new locomotives constructed. Assuming the duration of a locomotive to be from twenty to thirty years, a long time would elapse before the entire stock of a railway company would consist of engines so contrived. The directors of the Lancashire and Yorkshire and East Lancashire Companies have recently been aiming to accomplish the object by simpler and more direct means. The lines under the control of the two boards are nearly 400 miles in length, they employ about 300 locomotives, and the saving to be effected by using coal instead of coke would be at least £30,000 per annum. Mr. Jenkins and Mr. Lees, the locomotive superintendents of the two companies, have each perfected inventions which are exceedingly simple and inexpensive. That of Mr. Lees (of the East Lancashire) was put to the test on the 6th ult., on the railways between Manchester and Blackpool.

The distance from Manchester to Blackpool is 48 miles, and the 96 miles of line there and back was well adapted for a fair trial of the

* From the London Civ. Eng. and Arch. Jour., October, 1858.

invention. In going either way there are some severe gradients to ascend; two of them near Chorley, are as steep as 1 in 100; and there are also several sharp curves. For the purpose of the experiment a train was composed of fourteen or fifteen wagons loaded with old metal, two first-class carriages, and two break vans. The length of the train was 240 yards: its weight was estimated at 271 tons 15 cwt., including the engine and tender, which, when filled with coal and water, would be 41 tons 8 cwt. This is rather in excess of the average weight of ordinary luggage trains of thirty to thirty-four wagons. Mr. Fothergill, C. E., of Manchester, had charge of the experiment.

One of the main tests being to ascertain the economy of consumption, it was necessary to weigh the fuel upon the tender before commencing the journey. In this was included the quantity used for getting up the steam. For the same reason, on the return of the train, it was requisite to ascertain the quantity left in the tender and unconsumed in the fire-box. By deducting the latter items it was of course easy to calculate the net consumption and the cost per mile. Another important point was to see that the steam was kept as nearly as possible at an even pressure during the trip, and that to save fuel time was not lost in ascending steep gradients. Any delay of this kind would have to be compensated by great speed on more favorable parts of the line; and such irregularities might be a fruitful source of accident if allowed in the working of the ordinary traffic.

The train left the Salford station soon after twelve o'clock; and the journey to Bolton, a distance of 10 miles, and a rather heavy ascent, was made in thirty-five minutes. The distance from Bolton to Preston, 20 miles, was run in 43 minutes, and the remaining 18 miles in sixty-three minutes. The return journey occupied a much longer time, through detentions caused by trains being in the way, by rain having made the rails slippery, and other circumstances adverse to the experiment as regards economy. The results of the trip, however, were most satisfactory, the total consumption of coal being only about 39 cwt. for the whole journey. The coal used was that of the Ince-hall Company, at Wigan, costing 5*s.* 3*d.* per ton, and hence, the cost of the trip was about 10*s.* From experiments previously made, it appeared that with coke, which costs from 11*s.* to 11*s.* 6*d.* per ton, the expense of taking the train the same journey would have exceeded 20*s.* In two previous trials made by Mr. Fothergill—one with coal and the other with coke—over the same line, weather and circumstances being equally favorable to each, the cost was 9*s.* 5*d.* for the experiment with coal, and 22*s.* 3*d.* for that with coke. There seems to be no doubt therefore of the advantage of using coal in point of economy.

As regards the smoke-burning apparatus, the experiment was also highly satisfactory. The great desideratum is the proper admission of atmospheric air into the fire-box, and Mr. Lees secures it in a very simple and inexpensive manner. In the lower part of the fire-box door an opening is effected by an adjustable plate, and the admission of air can be regulated as desired. Inside the door is a hood, closed at the top over the aperture, and it acts as a deflecting plate to the air when admitted,

and forces it down upon the fire. Nearly at the further end, the fire-box is arched over with fire-bricks or tiles. The effect of the brick arch is, that on becoming red hot, it throws back the products of combustion, and thus causes a better mixing of the gases. If more desirable, the arch or mid-feather might be constructed of copper, with a water-space, so as to increase the heating surface of the boiler. The cost of the whole apparatus is only a few pounds per engine, and a sum of about 20*s*. per annum will be sufficient to keep each of them in repair. The directors of the East Lancashire Company have been so satisfied with its efficiency, that they have adopted it all but universally,—only two of their locomotives being now without it.

After careful observation throughout the journey, it was the general opinion that there was no smoke emitted from the chimney that could be considered a nuisance, or any thing approaching to a nuisance, by passengers or the public. There was occasionally a slight discoloration of the steam when more coal was added to the fire than is usually applied at one time, and the same is the case with coke; but the effect disappeared in a moment or two, and "the light and graceful steam cloud," as it has been termed, was left floating over the train as pure and white as it is ever witnessed during the consumption of coke. In some respects passengers will have occasion to rejoice at the change, for the little smoke that does from time to time escape unconsumed, when beaten down and confined in a narrow space by passing under a bridge or through a tunnel, is less sulphurous than coke: nor is it accompanied by such a cloud of small, sharp, blinding particles. If it could become offensive any where, it might be supposed to be so when the train comes to a stand in the large enclosed stations, and when the steam is shut off; but a contrivance, by which a jet of steam is thrown into the chimney during such stoppages, so nearly dissipates it, or prevents its formation, that the small quantity emitted is scarcely perceptible.

The wear and tear of fire-box and tubes is much lessened by the use of coal. In burning coke a large amount of sulphur is given off, which leaves a thick crust upon the tubes. This becomes so troublesome and destructive that engine-drivers are compelled to cleanse them at least once a day, and sometimes even more frequently. Such incrustation cannot be removed without more or less injury to the metal; and the sharp hard particles given out by coke fires, and drafted up the tubes, have the effect of cutting and wearing them away, especially at the edges. In burning coal the sulphur is supposed to pass off in a more volatile form, there is little or no incrustation, but the metal is found instead to be lubricated with a soft oily matter, which requires to be removed only about once a week. The economy in this respect will no doubt be considerable. During the experiments it was stated by Mr. Fothergill that the average duration of a set of tubes with coke would not exceed 94,000 miles; while with coal he had seen a set in use, and apparently not half worn out, after traveling 156,000 miles. The average with coal would probably reach 300,000 miles.

The best kind of fuel yet tried during the experiments to the present

time is said to be the Horbury coal. An experiment with Welsh smokeless coal entirely failed,—the bars of the fire-box getting clinkered over, so that the engine could not proceed.

On the following day an experimental trip was made over the same line of rails with the same train, but drawn by a locomotive having the smoke-burning apparatus invented by Mr. Jenkins, of the Lancashire and Yorkshire Company. This invention, which has been generally adopted by that company, is rather more expensive in its application than that of Mr. Lees, though still of very small cost; it is also very effective. Mr. Jenkins admits atmospheric air into the fire-box through a number of tubes in front of the fire-box and underneath the boiler. The outer part of the fire-box is furnished with a sliding plate, which can be worked by the engine-driver at pleasure, so that during the time of adding fresh fuel to the fire, by moving the plates the tubes are uncovered, and a good supply of oxygen is insured. He has also a perforated deflecting plate across the fire-box, to insure a better combustion of the gases, and prevent the escape of unconsumed carbon.

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*The Suez Canal Project.**

In the course of November next, says the *Daily News*, a general meeting will be held in Paris for the purpose of establishing a company for finally carrying out the project of the Isthmus of Suez Canal. The capital is said to have been nearly all subscribed in the following proportions:—

The Viceroy of Egypt, . .	£1,280,000
Turkey, Egypt, and Syria, .	840,000
France, . . .	1,600,000
Austria and Lombard Venetian, .	800,000
Russia, . . .	480,000
North of Germany, Sweden, Denmark, Hanseatic Towns, Prussia, Switzerland, Holland, and Belgium, . .	600,000
Spain, Portugal, Italy and Greece, .	400,000
United States of America, .	400,000
Leaving the portion reserved for England,	1,600,000
	£8,000,000

The whole capital to be represented by 400,000 shares of £20 each.

A New Method of Road-Making.†

The everlasting noise which is occasioned by the rugged material of our English roads, and the frequency of their being under repair, gives especial value to a fact which we find in the French papers. A new system of road-making has just been substituted for the ordinary roadway on a part of the Place du Palais Royal. A quantity of con-

* From the London Builder, No. 816.

† From the London Mechanics' Magazine, Oct., 1858.

crete, about 5 ins. in thickness, is first spread out, and on that is applied a layer of bitumen reduced to powder and in a boiling state. On this latter, which is also about 5 ins. in thickness, a quantity of river sand is sifted, and then the surface is pressed down by a heavy cast iron roller, weighing about two tons. In a few hours after, the road thus made may be passed over by the heaviest wagons without the slightest impression being left by the wheels. The same system is now being applied to part of the Rue St. Honoré comprised between the Palais Royal and the Rue de Richelieu, and in the latter street as far as the end of the Théatre Français.

Collapse of Flues.

The question of the resistance of thin tubes to collapse has recently occupied the attention of practical men; and some important facts, hitherto unremarked, or but partially investigated, have been brought to light. Mr. Fairbairn finds that the intensity of the pressure required to make a flue or other thin tube collapse, is directly as the square of the thickness, nearly inversely as the diameter, and *inversely as the length.* The diminution of the strength of a flue, as the length increases, is a law never before, it would appear, suspected. For computing the pressure in pounds on the square inch which a wrought iron flue can sustain, the following rule is sufficiently near the truth for practical purposes:—Multiply the constant factor 806,000 by the square of the thickness, in inches; and divide by the product of the length in feet, and diameter in inches. It is of great importance to strength that the flue should be as cylindrical as possible.—*London Artizan, Dec.*, 1858.

Experiments on Propellers.

In a former number of the *Journal*, we described a new propeller invented by Lieut. Vergne, the characteristic of which was the fluting or ribbing of the surface (*Journ. Fr. Inst.*, 3d Series, vol. xxxv., page 299). At the meeting of the Paris Academy of Sciences, 25th of October, 1858, M. Clapeyron presented the results of some experiments made with it.

Experiments on Le Vigilant.—The mean economy of fuel showed a gain in favor of the Vergne propeller of 17 per cent. The velocity was greater by more than half a knot, or 6 per cent. The new propeller turns more easily. The disturbance of the water near the stern disappeared; the wake was as smooth as that of a sailing vessel, and the whirlpool from the propeller appeared only at a distance of 7 or 8 metres astern.

Experiment on L'Austerlitz, reported by Lieut. Loyer.—With the former propeller the engines gave but 42 turns; the shaking disordered

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(*fatigued*) the engines; now the apparatus turns with ease and remarkable regularity, so that we shall gain by increasing as much as possible the number of turns. The maximum speed obtained is 9 knots under all sail, and making 43 turns. We have frequently had 8 knots in a calm, and with 12 furnaces lighted, out of 20. The wake of the vessel is as smooth as that of a sailing vessel, and we remarked no shaking. At night, by means of the phosphorescence, we could trace the water thrown from the propeller; it was seen to be driven directly astern parallel to the keel, and with a helicoidal form.

Trip from Cherbourg to Brest.—The *Austerlitz* made 9 knots with 47 or 49 turns. Last year, the *Ulm*, of 650 horse-power, made much better time than the *Austerlitz*, whose engine is only 500 horse-power. Upon this trip the two vessels sailed at the same time, and excepting some little oscillations, sailed the whole time in company. With common coal, the log of the *Austerlitz* recorded 10 knots, while the helix made 50 and 51 turns, without any shaking.

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*On Boiler-plate Joints.**

In the discussion of boiler-plate joints, Mr. Clark demonstrates that the bursting strain on the longitudinal seams of cylindrical boilers is double the strain on the circular seams. This is an important practical distinction, because it is clear that, to ensure uniform working strength, the longitudinal seams must be doubly fortified; and, in the consideration of the means of soldering, four distinct kinds of riveted joints are compared, and their relative strengths determined from actual trials. Welded joints are likewise discussed, and should the reported results of their capabilities to resist bursting strains be corroborated by advanced experience, they promise to supersede riveting, if not entirely, at all events for the principal joints. In the order of tensile strength the joints are ranged thus:—

1. Scarf-welded joint, . . .	100	
2. Double-riveted double-welt joint, .	80	per cent.
3. Double-riveted lap-joint, . .	72	"
4. Lap-welded joint, . .	66	"
5. Double-riveted single-welt joint, .	65	"
6. Single-riveted lap-joint, . .	60	"

In this comparative statement the strength of the entire plate is represented by 100; and the trials were made with plates varying from $\frac{3}{8}$ to $\frac{1}{2}$-inch in thickness. The relative strengths of single and double-riveted joints do not very materially differ from those deduced by Mr. Fairbairn.

* From the London Artizan, December, 1858.

AMERICAN PATENTS.

List of American Patents which issued from November 2 to December 7, 1858, (inclusive,) with Exemplifications.

NOVEMBER 2.

1. Method of Hanging Swords; Jonathan Ball, Utica, New York.

Claim—The arrangement and combination of the scabbard, plate, and bit-pin, with the belt or sash plate, as described.

2. Mechanism for Transmitting Rotary Motion; Gerard Bancker and Andrew Campbell, City of New York.

Claim—The use of the combination of the sliding clamping block and extension rod, with the double-acting clamping lever, made in the manner set forth.

3. Saw Gummer; Nelson Barlow, City of New York.

Claim—The arrangement of levers, C and D, rests, E and F, in combination with the milling cutter and clamp, as set forth.

4. Trucks for Locomotive Engines; Levi Bissell, City of New York.

Claim—The rigid truck frame attached to the engine by the bolt or pin, and receiving one pair of truck wheels, in combination with the double inclined bearings, for the purposes specified.

5. Tool for Chamfering Leather Straps; James Bridger, Richland, Iowa.

Claim—The tool described for chamfering and channeling leather straps.

6. Stoves; J. H. Buchanan, New Concord, Ohio.

Claim—The arrangement. consisting of the concave bed or ash-pit of larger diameter than the grate, and constructed with supporting lugs or ledges, semi-spherical open top grate or fire chamber, with draft space existing between it and the ash-pit or bed, and flaring stove-pipe, appearing as a continuation of the grate, and furnished with a transverse feed and draft door, and arranged above the fire grate, and made adjustable in a vertical line with the fire grate on a vertical standard, as set forth.

7. Gate Hinge; C. E. Burnham, Binghampton, New York.

Claim—The pintles placed within the sockets that are attached to the ends of the gate, in connexion with inclined planes and steps attached to the posts, the spring acting or bearing on the pintles, and the levers, or their equivalents, connected to the pintles through the medium of the rods and arms, as described.

8. Raking Attachment to Harvesters; W. W. Burson, Yates City, Illinois.

Claim—1st, The transverse hinging of frame for elevating the rake as it moves to the rear. 2d, Adjusting the rake in its position for starting by the gravity of the gear portion of the raking mechanism, combined with the transverse hanging of the frame, the operation being as described. 3d, The combination of the tilting platform, stubble leveler, and glancing board, with the rake for collecting and delivering the cut product. 4th, The combination of shaft, cam-wheel, spring, and slotted step, as set forth.

9. Arithmometer for Addition; O. L. Castle, Upper Alton, Illinois.

Claim—1st, Combining the shaft of the driving-wheel, which serves to give motion to the register, with the keys, by means of a series of ratchet-wheels on the said shaft, and a series of levers of different lengths which work on said shaft as a fulcrum, and are connected with the keys, when the whole are arranged as set forth. 2d, Combining the register wheels of lower denomination with those of higher denomination, by means of the pawls, ratchet-wheels, and stationary plates. 3d, The springs with their elastic arms, applied to the register wheels, in combination with the stationary plates and their projections, to operate substantially as set forth.

10. Railroad Ditching Machine; Wm. Chadwick and S. J. B. Anderson, Terre Haute, Indiana.

Claim—The levers, 2 4 7 and 9, arranged on a car, for holding the scoops at the side of the car, and for adjusting or raising and lowering them, as required. Also, the levers, 1 3 5 6 8 and 10, arranged on a railroad car for operating the scoops so as to catch their load of earth, and for dumping them as required. Also, the scoops, made so that they may be worked either end forward, the same side up to be filled. Also, the vibrating mouth-piece hinged to the scoop, so as to be vibrated substantially as described.

11. Car Axle Boxes; John W. Cochran, City of New York.

Claim—1st, The sliding collar, constructed and arranged upon the axle and in relation to the packing of the box, as set forth. 2d, The arrangement of the lubricator, door, disks, packing, follower, and bolts, whereby the whole may be adjusted to the bearing brasses, as set forth.

12. Machine for Cutting Corks; Edward Conroy, Boston, Massachusetts.

Claim—1st, The combination and arrangement of the sliding plate, V, sliding plate and spring or pointers, W, in front of the same, vibrating angular lever, Y, and cams, a a, on inclined revolving shaft, P2, partly cogged wheel, R, and spring arbor or shaft, T, for placing and securing the rough pieces of corks to be cut between the pointed end of the said arbor or shaft, T, and correspondingly pointed revolving hub, U′. 2d, The combination of the cam, K, secured to the top of the frame, A, and curved spring, J, with the sharpening device, G, and rotating cutter plate, H, for sharpening the cutters after they have cut the cork, and are in the act of being again withdrawn, and moved toward the arbor or shaft, T. 3d, The combination of the cam, o3, and friction roller, b, with the sliding frame, B, as set forth.

13. Grain Separators; William R. Cox, Delphi, Iowa.

Claim—The spouts, provided with the deflectors connected by the trough, and arranged relatively in respect to each other and to the spout and trunk, substantially as set forth. Further, in combination with the above, the loaded valve applied to the trunk, and used in connexion with the spouts, for the purpose specified.

14. Bank Locks; Lyman Derby, City of New York.

Claim—1st, The use of the bars or cross-bars secured on an axis eccentric to its true centre, for the purpose of obtaining gravity to unlatch them, in combination with the inside of the door of a safe or other place.

2d, The use of a pendulous latch lever, secured to the inside of a safe, in combination with the bars or cross-bars operating on the inside of the door of a safe. 3d, The use of the application of a clock-work movement, in combination with an inverted Y shaped pendulous latch lever and bars or cross-bars, on the inside of the door of a safe, for the purposes set forth.

15. MANUFACTURING STEEL; Joseph Dixon, Jersey City, New Jersey.

Claim—The process of making steel by heating pig or cast iron, covered or stratified by any substance which will preserve a separation of the plates or pieces of iron through the process of heating, except so far as the use of oxide of iron as a separating material by any patent referred to.

16. HARPOON; George Doyle, Provincetown, Massachusetts.

Claim—1st, Attaching the shank of the harpoon to the head, so that when the latter turns in the fish, the flat side instead of the edge shall be presented to the resisting body. 2d, The slots and lip, operating substantially as set forth.

17. TACKLE BLOCKS; John Ferrier, Charlestown, Massachusetts.

Claim—Placing two rows of pulleys in each block, the axis of one row being at right angles to the axis of the other, and the rope passed or adjusted around the pulleys, as set forth.

18. GAS-FITTERS' VISE; Joseph S. Ford, Philadelphia, Pennsylvania.

Claim—The upper die and lower die, in combination with the screws, the said dies having two or more semi-circular recesses, situated in respect to each other and to the screws substantially as set forth.

19. CAR SPRINGS; Perry G. Gardiner, City of New York.

Claim—As my invention the following named improvements and features in the conical coiled steel spring, viz:—1st, Its construction out of a plate or bar not thinned, slotted, or hammered out at the ends, which is to constitute the apex of the spring. 2d, Nicking or compressing the face of the plate (as shown at the line,) without breaking or cutting the fibre of the metal, for the purpose described.

20. PLOUGHS; John Gehr, College of St. James, Maryland.

Claim—The hollow corrugated roller, in combination with the mould-board, brace, and guard, arranged substantially in the manner set forth.

21. STRAW CUTTERS; Oliver C. Green, Dublin, Indiana.

Claim—The described arrangement of the hinged connecting rod, lever, spring, pin, sliding gate, and oblique knife, with the V-shaped knives at the end of the trough.

22. JOINT FOR T-RAILS; Wm. Harvey, Albany, New York.

Claim—The arrangement and combination of the laterally tongued side plate with the rails, chair, and side piece, as described.

23. RAILROAD CHAIRS; P. F. Hall, Troy, New York.

Claim—The combination of the plates, b b c, and lips or jaws, a and c, together with the draw bore spiking of the same, by which they are keyed and also wedged and fastened to the tie by one operation, as specified.

24. SEEDING MACHINES; Aaron Hatfield, Petersburg, Illinois.

Claim—The arrangement of the seed hoppers represented, in combination with the mechanism for driving the seed slides and dropping the grain or seeds, and covering them as described.

25. DRINKING CUP; Louis Grosholz, Philadelphia, Pennsylvania.

I do not desire to confine myself to the employment of three sections, inasmuch as two might be used for a small sized cup, and for those of a larger size, four or five sections might be advantageously employed.

Claim—A drinking cup formed of two or more sections with inclined sides, said sections being adapted to, and detachable from, each other, substantially as set forth.

26. SEEDING MACHINES; Wm. Y. Henry, Monmouth, Illinois.

Claim—Connecting or arranging the levers or rods of the pestles or weights, and the levers of the tubes, when used in combination with the wheels connected with the slide, and the whole arranged to operate as set forth.

27. TAP FOR CUTTING WOODEN SCREWS; W. O. Hickok, Harrisburg, Pennsylvania.

Claim—Making screw-threads around the outer surface or periphery of the cylindrical projection, so that they shall operate in the manner and for the purpose described, the said projection being made slightly larger than the hole in the wood in which the required screw is to be cut.

28. DIE FOR CUTTING WOODEN SCREWS; W. O. Hickok, Harrisburg, Pennsylvania.

Claim—The reduced sectional thread, in combination with the first cutter, when the same is made to operate in the manner set forth.

29. IMPROVED LOCK AND KEY; Joseph Hoffacker, City of New York.

Claim—1st, Constructing a lock which is closed or locked by the bolt shooting forward and upward, and which is opened or unlocked by a screw-key urging the bolt downward and backward. 2d, The construction of the bolt, in combination with the barrel and three springs. 3d, The combination of the door handles with the lever. 4th, The construction and operation of the screw-key, substantially as described.

30. THRESHING MACHINES; Abram Jackson, Lebanon, Tennessee.

Claim—The arrangement of the band wheels upon the spokes of the wagon wheels in connexion with the hounds, substantially as described.

31. FILTERING COCK; Lemuel P. Jenks, Boston, and Francis Draper, East Cambridge, Massachusetts.

Claim—The combination and arrangement of a filtering cock, substantially as described, giving the optional transmission of the water through the filtering medium in either direction, or through the filtering case, the former without unnecessary impediment to the current, by one passage across the width of the filter from a rotating two-way cock placed by the side of the filtering medium, and closed or discharging at pleasure, the filtering case and the filtering medium being stationary.

32. SAUSAGE MACHINE; R. V. Jones, Johnstown, Pennsylvania.

Claim—The arrangement of flanched cylinder with a knife having hooked or V-shaped teeth, substantially as specified.

33. SHIELD PINS; Josee Johnson, City of New York.

Claim—Shielding the point of the pin within folds or coils when turned on both sides of the main stem, as described.

34. CAR SEATS; P. P. Joseff, Philadelphia, Pennsylvania.

Claim—The combination and arrangement of the slotted vertical bar, having grooved wheels on its face, cogged plate, pinions, radial arm, and wrist-pin or stud, projecting from the end of the movable seat bottom and jointed crank, in the manner described.

35. SASH FASTENER; Edward M. Judd, New Britain, Connecticut.

Claim—Attaching the rod to the spring by means of the grooves in said rod, the button at its end, and the hole and slot in the spring, substantially as set forth.

36. SEEDING MACHINES; H. Kaller, Perry, Illinois.

Claim—The cylinders provided with the seed cells, having the slides attached and arranged within the tubes, and relatively with the hoppers to operate as set forth.

37. STRAW CUTTERS; James Lashbrooks, Rockport, Indiana.

Claim—The two rollers provided with the circular toothed blades, in combination with the clearers, arranged to operate as set forth.

38. MINERS' RAILROAD TURN OR CIRCULAR SWITCH; E. B. Lowman, Bellair, Ohio.

Claim—The arrangement of the crossings, as seen at letters C, D, E, F, M, N, and L, fig. 1, together with its adaptation to the working of miners on either side of the entry, by reversing its position on the main stem.

39. MACHINE FOR SOLDERING; E. Manley, Marion, New York.

Claim—Arranging within and in the desired relation to the furnace, mounted on wheels, and constructed as set forth, an inclined copper bar or soldering tool, having notches on its lower surface, and a wedge or key above, for retaining it with the required degree of heat, in combination with the inclined conducting tube and hinged box, and its attachments divided into two compartments for the solder scraps and resin.

40. SMOKING TUBE; Charles Matthews, City of New York.

Claim—Arranging the tubes, C and E, with the mouth-piece, in such relation to each other that they form a compound smoking tube for smoking tobacco, or other substances, in a finely divided state. Also, closing the upper end of the tube, E, in such a manner that the same when inserted into the draft tube, C, and brought close up to the inner end of the mouth-piece, leaves a sufficient space for the passage of the smoke up through the central opening of the mouth-piece described. Further, constructing an ash-pan in such a manner that the same slides on the compound smoking tube by means of a loop, so that the ashes dropping from the lighted end of the tube are deposited in the ash-pan.

[This invention consists of two tubes of thin paper, one of which fits into the other, with barely space between for the passage of the smoke. The inner tube is closed at the bottom by an oblong piece of stiff paper bent over its end in the shape of a letter U, and contains the substance to be smoked in a state of fine powder. A firm and thick paper tube, from 1½ to 2 inches long, is fitted into one end of the outer tube, to serve as a mouth-piece, and also as a support for the inner tube—of which the closed end reaches and is fastened to it, but so as not to close it (viz: the mouth-piece,) entirely; the curved form of the end of the inner tube permitting the smoke to pass freely on either side of it. This compound tube, when filled, is twisted to a tapering end, which, when used, is inserted into the collar of the ash-pan, which is an oblong dish or pan, about 2½ inches long, of very light metal, in the form of a trough, having at one end a collar or loop of proper diameter and half an inch long. The object of this pan is to catch the ashes, and as the cigar burns away, the pan is made to slide along towards the mouth of the smoker.]

41. PLOUGHS; A. A. McMahen, Oxford, Mississippi.

Claim—In combination with a coulter having a brace and adjusting openings therein, a mould-board whose shank is made adjustable in the beam, so that said mould-board may be adjusted to the coulter and in the beam, as described.

42. PRESSES FOR EMBOSSING AND FIGURING VELVETS, &c.; John Nagle, Altoona, Pennsylvania.

Claim—1st, The application of steam to presses for figuring silks, velvets, and similar materials. 2d, The combination of rollers, A, B, B, C, with the wheels, r r, and chain, Z. 3d, The double lever, in combination with the chain, H, and weight, W. 4th, The movable guide, in combination with the rollers, all in the manner described.

43. REFRIGERATOR; Benjamin M. Nyce, Kingston, Indiana.

Claim—1st, The employment of the fan, when arranged as set forth, for producing a circulation of the contained air, so as to bring it in immediate contact with the lime, or other dessicating composition, for the purposes specially set forth. 2d, The peculiar construction of the beam, T, that is to say, I claim the metal bar, X, the insulating beam, V, the trough, Y, and supporting beam, U. 3d, The partition, when arranged and operating substantially in the manner set forth.

44. TRAP FOR ANIMALS; R. L. Payne, Halifax, Virginia.

Claim—The arrangement of the separate balanced fingers in connexion with the box or body of the trap, as described.

45. TRIPPING BLOCK FOR BOAT DAVITS; Charles Perley, City of New York.

Claim—The tripping or disconnecting block, constructed as specified, and applied to davit blocks for boats' or to other purposes, as set forth.

46. METHOD OF ADJUSTING THE PLUMMET WITHOUT MOVING THE TRIPOD IN SURVEYING INSTRUMENTS; Charles A. Saxe, Philadelphia, Pennsylvania.

Claim—The arrangement described for placing surveying instruments' centres over any point within the circle, K, without moving the legs of the instrument, and unscrewing the leveling screws, but by unscrewing the screws, C C, moving the ball plate, A, and revolving the ring, H, as described.

47. HAND PRINTING PRESSES; J N. Phelps, City of New York.

Claim—1st, The combination and arrangement of the radial pins on the transverse shaft and shoulder cams on the sides of the lever, oscillating arms, J, spiral springs, U, for moving the same automatically, and spiral springs for pressing the inking roller in contact with the printing rollers, Q R, when receiving the ink from the same, and in contact with the face of the type in the form secured to the under part of the platen. 2d, Arranging the inking rollers, Q R, in the relation to each other and to the inking roller, K, at the lower end of

the bars or arms, and the lower surface of the platen, when raised as described, and in combination therewith. 3d, The segmental shield or plate, so arranged in relation to them and the corresponding segmental formed arm or support, as to thoroughly protect the sheets of paper being imprinted, from contact with the said inking rollers, and enable its edges to be moved upward in the space between the shield or plate, and arm or support, substantially as described.

48. Lifting Handles; Joseph B. Sargent, New Britain, Connecticut.

Claim—"A lifting handle" with the plate cast in any metal that can be bent, having the socket formed in the manner described, and operating in connexion with the handle, as specified.

49. Hemp Brakes; William Shelby, Waverly, Missouri.

Claim—The arrangement of the beaters or blades at varying distances, in combination with the yielding plates, as described.

50. Combined Book and Slate; Forrest Shepherd, New Haven, Connecticut.

Claim—The combination of the slate with the book, when so connected and arranged that the slate can be used with equal convenience and facility with each page of the book, while the page and the slate are continually before the eye of the user, as represented.

51. Car Seats; John W. Sibbet, Cincinnati, Ohio.

Claim—Constructing every alternate seat in two distinct parts, and providing the upper detachable portions with guiding hubs at their ends, to which are attached straps or bands for elevating them, horizontal spring bars whose ends enter slots in the guide columns or posts for sustaining them, in conjunction with the straps or bands in their elevated portions, and combining with the said upper detachable portions and the permanent seats pieces of cushioned or stuffed cloth, or other material, capable of being packed in the boxes of the seats, the whole being constructed substantially as described.

52. Railroad Chairs; James H. Simmons, Painted Post, New York.

Claim—The construction of a chair raised in the centre for the ends of the rails to rest on, and sloping from near the centre toward each end of the chair, leaving a space between the rails and the chair over the sloped portion to accommodate the spring of the rails together with projections, as described.

53. Candlesticks, &c.; Samuel Slocumb, Cambridge, Massachusetts.

Claim—A lamp stand having a metal socket, a glass shank, and a marble base, the whole being secured together by the rod, D, as set forth.

54. Preparing Wool and other Fibres for Spinning; Waterman Smith, Manchester, New Hampshire.

Claim—In the process of drawing wool and other fibrous substances, heating the sliver of wool, or other substance, and keeping it hot while it is being drawn, by passing it over or against, and in contact with, heated surfaces, either moving or stationary, substantially as described.

55. Machine for Creasing and Blacking Leather for Harness; Adolph Stempel, Oquaroka, Illinois.

Claim—The pressure rollers and the creasing and embossing rollers, in combination with the color fountains and felt rolls, the whole being arranged as set forth.

56. Pedal Attachment for Pianos; Wm. B. Stetson, Taylor, New York.

Claim—The construction and arrangement of the pedal chord bars, connecting suspension rods, and upper bars, and finger rods, and operated as described, in combination with key-board instruments, and whereby the corresponding harmony of any melody or air is produced simultaneously therewith by the performer, through the agency of the feet.

57. Safety Apparatus for Steam Boilers; Francis Stebbins, Hinsdale, New Hampshire.

I am aware that it is not new to so combine a vessel with a boiler and an alarm or signal apparatus, that such vessel, when the water in the boiler may be above its lowest safe water level, shall be kept filled with water by the pressure of the steam, and when such water may fall below such level of safety, such vessel, by the entrance of steam into it, shall be emptied of its water, and thereby, by the abstraction of the weight of water from such vessel, the alarm or signal apparatus shall be put in operation, and therefore I do not claim such. Although I maintain this principle of operation in carrying out my invention, I effect an important and valuable improvement, as my invention rests on an improved mode or means of carrying out such principle, and consists in an arrangement of pipes with respect to the vessel and boiler, whereby the steam and water passages are entirely separate from one another, so that the water does not hinder or obstruct the passage of the steam from the boiler to the vessel, D, one not having to rush directly by, and in oontact with, the other, while the steam may be flowing into the vessel, D, of the safety apparatus. Furthermore, my arrangement presents other advantages, as by means of it the safety apparatus is entirely out of the boiler, and is not liable to be injuriously affected by the foaming of the water in the boiler.

Claim—The improved safety apparatus, as specified, or the above described arrangement of the two separate steam-pipes, the two separate water-pipes, and tubular shaft, together and with respect to the boiler, A, the vessel, D, and its loaded level, C, and so as to enable the whole to operate substantially as explained.

58. Speed Indicator and Recorder for Railroad Cars; J. Dutton Steele and William Lorenzo, Pottstown, Pennsylvania.

Claim—The governor shaft and indicator, and the shaft carrying the prepared paper, in combination with the main driver, as described.

59. Harvesters; Charles T. Stetson, Amherst, Massachusetts.

Claim—Combining two double-edged cutting blades with each of the vibrating cutter shanks, for the purpose of reducing the number of joints in the cutting apparatus. Also, combining an inwardly extending curved arm with the inner end of the finger bar, when the vibrating end of said arm is made to play between guiding cheeks or in a guiding groove, and the said inner end of the finger bar is jointed to a vertically sliding head, substantially in the manner set forth.

60. Lock; O. B. Thompson, Hudson, Ohio.

Claim—The tumblers, f, and guards, g, constructed, arranged, and placed in such relation with the plate, b, of the bolt tumbler, c, and slides, j, to operate as set forth. Also, in combination with the above parts, the bar, arranged so as to be acted upon by the arbor bit to adjust the tumblers, f, as the bolt, B, is shoved out from the case. Further, the plate, l, and buffer, m, placed at the back part of the slide chamber, E, substantially as set forth.

61. Seeding Machines; Joseph Walton, Delavan, Wisconsin.

Claim—The rotary disk, in combination with the throat, the partition, the valve, the finger, and the grass seed hopper, when the whole are arranged as set forth.

62. Car Brakes; J. N. Ward, Brooklyn, New York.

Claim—The combination of the pulleys and brakes, together with the mode of operating the same, the whole being constructed and arranged as specified.

63. Self-inking Hand Press; Daniel Zuern and L. L. Bevan, Shamokin, Pennsylvania.

Claim—The combination of the arm or lever, G, with the shaft, H, the crank, L, and the vertical revolving shaft, J, and the connexion of shaft, J, with the revolving arm, K, thereby accomplishing a double action, viz: first, upon the ink roller, D; second, upon the movable bed, E, for the reception of card or paper to be stamped or printed—by down vertical pressure of lever, A, roller, D, moves horizontally over ink sponge, F, and in contact with it. Also, the combination of finger, d, with hook, e, on movable bed-plate, with the mode of adjustment and disconnexion, for the purpose of effecting movement of movable bed-plate, E, and also the movable bed-plate, E, for the purpose substantially as set forth. But we do not claim any other part or portion of the machine as new, or of our invention.

64. Axle Boxes; Henry Howson, Assignor to Isaac P. and Jacob L. Wendall, Philadelphia, Pennsylvania.

Claim—The combination of the box with the bearings, B and B′, and retaining keys, C and C′, when the interior of the box is arched on the top, when the said arch terminates on each side of the recesses, g g, formed in the sides of the box, when the keys are adapted to fit into the recesses and against the edges of the bearings, and when the several parts are arranged in relation to each other, substantially in the manner and for the purpose set forth.

65. Weighing Carts; James W. Martin, Assignor to Lewis Rothermel, Philadelphia, Pennsylvania.

I do not claim the application of a scale beam to a cart, for the purpose specified, for this has been formerly done, and may be seen in the device patented by me, and formerly alluded to.

Claim—The shaft, E, provided with hooks, d d, and arms, e e, which are connected by rods, f f, with lever, h, having their fulcra, i, connected by pendants, j, to the arms, k, of a shaft, l, which is connected with the scale beam, G, by the arm, o, and rod, a, the rods, q, of the body resting on the lever, h, when the latter raises the body, and the latter provided with the rod, c, for the hooks, d, to catch over, the whole being arranged substantially as set forth.

66. Padlocks; E. M. and J. E. Mix, Assignors to selves and C. D. Johnson, Ithaca, New York.

Claim—The combination of the curved or bent tumblers, a, and dog, D, provided respectively with springs, c k, and arranged relatively with the bolt or shackle, B, to operate as set forth.

67. Billiard Table; Daniel D. Winant, City of New York, Assignor to William R. Winant, Brooklyn, New York.

Claim—1st, Constructing the beds of billiard tables of slabs of glass, substantially as specified. 2d, The clips, c c, taking the beveled edges of the slab to retain the same, as described. 3d, The block, e, receiving the screws, g, of the cushion rail, as described.

68. Mechanical Movement; Joseph H. Davis, Woburn, Massachusetts.

Claim—The arrangement set forth for transmitting power from any prime motor to a propelling gear or wheel, viz: through the intervention of a series of curved or bent and weighted arms, said arms working together and connected to the gearing at their ends, substantially in the manner set forth.

69. Rudder for Vessels; Silas Yerkes, Jr., Assignor to self and George Yerkes, Philadelphia, Penna.

Claim—The gearing of the outer or aftermost of the two hinged portions of the rudder with a fixed gear or toothed arc attached to the vessel, substantially as specified.

[This rudder is made in two parts, called by the inventor the "main rudder" and "outside rudder." The former is hinged in the same manner as a common rudder, to the stern-post of the vessel, and the other one is hinged in a similar manner to the back of the fast one, and has secured to it a concentric toothed gear, which gears with a stationary toothed arc, concentric with the first one. The main rudder is operated in the usual way, and by its action the outside one is caused, by the arc and gear, to move faster in the same direction, and the two combined produce a greater effect on the water by a given movement of the steering apparatus than a single rudder presenting the same area of surface.]

NOVEMBER 9.

70. Knitting Machines; Walter Aiken, Franklin, New Hampshire.

Claim—The peculiar shaped cam groove, constructed as described. Also, the selvage fingers, as described.

71. Revolving Fire Arm; Ethan Allen, Worcester, Massachusetts.

Claim—1st, Forming the stud or pin to support the tumbler and hammer solid with the case or frame, when the hammer is placed outside the case, as described. 2d, The cam surfaces of the tumbler and piece, L, or their equivalents, to rotate the cylinder, by means of the piece, M, in the manner set forth.

72. Flour Coolers; Horace B. Allis, Little Rock, Arkansas.

Claim—The combination with a cooler hung so as to revolve upon a nearly horizontal shaft of nearly radial screens; and also the combination therewith, as an auxiliary to accomplish the desired result, of the solid flanches for checking the motion of the meal till the screens have arrived at the proper angle to properly distribute the meal.

73. Sewing Machines; Otis and Zelotes W. Avery, Bethany, Pennsylvania.

Claim—The combination of the rocker or yoke, pivoted as described, and the presser, operated as set forth, for the purpose of firmly holding the cloth whilst it is being fed up or moved, as represented. Also, in combination with the beam, H, and its cam, q, the bar, o, and its cam, r, when said parts effect the purposes described.

74. Hoisting Machines; Daniel W. Barr, Lancaster, Pennsylvania.

Claim—The central pulley, beveled cog-wheels, and drums, side wheels, double pulley hoisting tackle, slide door, drum and crank, with cord.

75. Apparatus for Wetting Paper; Moses S. Beach, Brooklyn, New York.

Claim—The employment of the cloth, arranged and operated substantially as described.

76. Printing Presses; Moses S. Beach, Brooklyn, New York.

Claim—Producing intermittent blasts of air by means of the revolving hollow core having openings, and the stationary box having openings, arranged as described.

77. Feeding out Paper from Printing Presses; Moses S. Beach, Brooklyn, New York.

Claim—1st, The stationary guides and the arrangement of the rollers, or their equivalents, by which sheets coming from different directions are conducted into a single set of guide tapes or strings, in the manner described. 2d, Counting sheets into desired quantites by a counting table, consisting of an endless belt having an intermittent motion, arranged as described.

78. Blacksmiths' Tuyere; Harvey S. Berry, Rutland, Vermont.

Claim—A tuyere revolving in a wind-box supplied with wind in any ordinary way, with apertures in it, so arranged as to bring more or less of them at pleasure to bear upon the fire, and thereby diminish the fire and circumscribe the space affected by the blast, or enlarge the space and increase the fire.

79. Ploughs; John M. Burke, Dansville, New York.

Claim—Depressing and bending inward the rear and lower edge of the mould-board, as described.

80. Machinery for Pressing Tobacco; Wm. Cameron, Petersburg, Virginia.

Claim—1st, The construction of the ring which contains the tobacco boxes, viz: by segments held together by a band which can be tightened or loosened, and move independent of said segments, as set forth. 2d, The forming of a press by means of one, two, or more of such rings, enclosing a series of tobacco boxes with plates above and below them, and screw-rods furnished with hand wheels and nuts passing through said rings and plates.

81. Rendering Paper and other Fabrics Incorrodible; Thomas G. Chase, Philadelphia, Pennsylvania.

Claim—The application of paraffine either alone or in combination with naphtha, for the purposes described, so as to secure paper and other fabrics from the corrosive action of caustic alkali, in order that it may be put up securely in small parcels.

82. Propeller; George R. Comstock, Little Falls, New York.

Claim—The series of spring blades, hung and reversed, in combination with the cutting edges of the vibrating frame, the operation being substantially as specified.

83. Pen Fountain; John S. Cutts, Philadelphia, Pennsylvania.

Claim—The elastic tubular fountain open at both ends, and so combined with the pen that the fountain may be filled with ink through its upper open end by dipping the pen, as set forth.

84. Lacteal Instruments; Charles H. Davidson, Charlestown, Massachusetts.

Claim—Constructing the article known and worn as "breast shell," and made of any size, form, or material suitable for the performance of the well-known functions or uses proper of such device, with a transfer pipe or tube forming an integral part of the shell, when said tube is arranged as described, and serves for the ready and advantageous attachment of a flexible pipe with nipple jointed to it.

85. Aquaria; Elijah D. Davis, Brooklyn, New York.

Claim—1st, The mirror extending above the level of the front plate, and arranged in relation thereto, and to the contents of the aquarium, substantially in the manner set forth. 2d, The sustaining of the earthy matter in removable bottom, and protecting its upper surface by a hand coating, for the purposes as set forth.

86. Cushions for Billiard Tables; Levi Decker, Bergen, New Jersey.

Claim—The combination in a billiard table cushion of stretched and unstretched rubber, for the purpose described.

87. Life-Preserving Vests; T. A. Delano, City of New York.

Claim—A life-preserver having elastic fastenings or straps, and an inflatable air chamber or float, extending from the breasts underneath the arm holes, as described.

88. Operating Churns; Joseph Forsyth, Wheeling, Virginia.

Claim—The combination of the carriage with the movable platform, substantially as described.

89. Method of Opening and Closing Farm Gates; Wm. G. Hermance, Geneva, New York.

Claim—The suspension of the gates by means of suspension bars of unequal length with pulleys and slat heads, arranged as set forth.

90. Burglars' Alarm; N. Jensen, Washington City, D. C.

Claim—1st, Supporting the taper by a spring socket, arranged substantially as described, so that by the movement of the socket when the holding catch is withdrawn, the taper is lighted. 2d, On releasing the spring socket holding the taper, I claim lighting the taper and causing the alarm to be sounded by the movement of the socket. 3d, Arranging the alarm and the light in separate compartments in the box, for the purposes set forth. 4th, The fuse tube, constructed and arranged as described, so that the gases escaping from the vent will pass over the flame, and not come in contact with and extinguish the light.

91. Sleeping Berths for Railroad Cars; D. M. Lawrence, Cincinnati, Ohio.

Claim—The arrangement of the strap hinge, in combination with the ball and socket hinge, for the purpose of securing adjustable platforms or sleeping berths for railroad cars at any desired elevation.

92. Rotary Harrows; Wm. H. Main, Liverpool, Ohio.

Claim—The combination of the arm or centre pin, draft bar or platform, with the seat, for the purpose of causing the harrow to rotate by the weight of the person on the seat.

93. Printing Presses; Charles Montague, Hartford, Connecticut.

Claim—Communicating motion to the cylinder at the time of giving the impressions, by and through the motion of the bed, while the revolution of the cylinder shall be perfected by or through ordinary gearing, or other means entirely independent of the motion of the bed, thus alternating from one of these means to the other, to give a full revolution to the cylinder, in the manner substantially as set forth.

94. Shears for Cutting Sheet Metal; Daniel Newton, Southington, Connecticut.

Claim—The application to circular shears of two rods with a revolving cutter on each rod, sliding either way, to adjust the size of the circle.

95. Galvano-Electric Machine; Joseph R. Palmenberg, City of New York.

Claim—The arrangement and construction of a magneto-galvano electrical machine, having the helix and spring hammer, &c., situated in the inner part of the block or stand which supports all the other parts, and protected from any external danger through which the action of the apparatus might be deranged, substantially as specified.

96. Bee-Hives; Ebenezer W. Phelps, Elizabeth, New Jersey.

Claim—The small sectional adjustable frames, set in the main frames by means of half round grooves and rod, operating as described.

97. Securing the Ends of Railroad Bars; Augustus Plinta, Albany, New York.

Claim—The formation of a smooth joint where the ends of hollow rails meet, by inserting therein a plug of iron or dowel, movable by a pin, in combination with a transverse wedge, washers, and wedge-shaped spikes, combined and arranged substantially as described, when used without a chair.

98. Harvesters; Hosea W. Read, West Windsor, Vermont.

Claim—In its arrangement and combination with the tilting frame and the machinery for operating the cutters applied thereto, as described, a screw-rod or mechanism for spreading the bars of the tilting frame asunder, so as to throw the pinions of the cutter mechanism out of engagement with the gears of the driving-wheels.

99. Frames for Umbrellas and Parasols; Frederick Reichhold, City of New York.

Claim—Making the stretcher and rib of two wires each, forming the loops or eyes of the rib by coils of the exterior wire, and attaching the stretcher to the rib, the rib to the notcher, and the stretcher to the runner, by coils or hooks of the exterior wire.

100. Drop for Forging Metals; E. K. Root, Hartford, Connecticut.

Claim—The method of elevating the drop or hammer by means of a lifting strap having a vertical reciprocating motion, in combination with the retaining notches and pawls and the spring bolt, or their equivalents. Also, the method of disengaging the drop or hammer from the elevating straps by means of a wedge-shaped shoe on the strap, which strikes the end of the bolt, or its equivalents, and forces it clear of the strap, and into engagement with the retaining latch. Also, the employment of an adjustable disengaging shoe, in combination with the series of retaining notches and pawls, whereby the hammer may be readily disengaged from the lifting straps, and retained at any desired height from the base block. Also, the sliding ratchet bar, in combination with the retaining notches in the posts, and retaining pawls on the hammer, when arranged as described. And finally, in combination with the bolt which forms the connexion with the elevating strap, and with the retaining latch which holds the slide when disengaged from the elevating strap, or their equivalents, the employment of the angular lever, or its equivalent, by which the hammer may be readily disengaged from the elevating strap by the operator at any required point in the ascent of the hammer.

101. Connecting Metallic Tiles, Plates, Beams, &c.; Silas T. Savage, Albany, New York.

Claim—The application and use of hook and clasp-shaped terminals, at the ends or edges of malt kiln tiles and beams, or analogous structures, such as floors and beams of any kind, for the purpose of attaching them to each other, and supporting them firmly in a proper position.

102. Manufacture of White Lead; Benjamin F. Smith, City of New York.

Claim—Preparing the metallic lead for the purposes of perfect corrosion, by exposure to the action of acids, or other substances, in "spangles" of the size and configuration, substantially as described. Also, preparing the metallic lead for the purposes of perfect corrosion by exposure to the action of acids, or other substances, by causing melted lead to drop in a finely divided stream or streams upon a corrugated cylinder, or its equivalent, revolving or moving so as to throw off solid "spangles" of more or less the form and thickness described.

103. Elastic Material for Mattresses and Cushions; Thomas B. Smith, Marietta, Ohio.

Claim—The compound coil of spiral woody fibres described, when prepared as described, and used as a substitute for curled hair.

104. Machinery for Manufacturing Shirred Goods; Richard Solis, New Brunswick, New Jersey.

Claim—In combination with the rollers, or equivalent means for cementing the two lamina of cloth, and the rollers, or equivalent means, for keeping the united lamina distended, and for moving them as described, the employment of a bar, or the equivalent thereof, over which the united lamina are drawn to form the turned or lapped selvages. Also, in combination with the selvage bar, or its equivalent, and the means described for moving and keeping the lamina distended, or equivalents therefor, the employment of pins for turning the edges in forming the turned or lapped selvages.

105. Shirt Bosom Folders; John Stevens, City of New York.

Claim—The combination of a series of tins made with a series of pins, arranged in a slot in the angle irons attached to the bed-plate, the pins being adjustable, by means of which the plates can be made of any desired width without different sizes of tins, with the lifters for raising the tins from the pins.

106. Machine for Filing Saws; C. and R. D. Tabor, Ischua, New York.

Claim—The use of the file carrier and pressure frame, in connexion with the carriage, clamping jaws, and revolving platform, when constructed as specified.

107. Furnaces for Tempering Steel; Joseph Thomas, City of New York.

Claim—Arranging a plate, B, in an upright furnace with a central passage, a, in such a manner and in such relation to a tank, D, containing water or other suitable liquid, that a piece of steel wire or a strip of sheet steel may be heated and hardened without coming in immediate contact with the fire, by passing the same through the passage, a, and through the liquid contained in the tank, D. Also, arranging the two furnaces, A and E, and the tank, D, in such relation to each other that a piece of sheet wire or a strip of sheet steel may be hardened and tempered by one operation by passing the same through the plate, B, in the furnace, A, and through the liquid contained in the tank, and from thence between the plates, F and G, which are heated by the fire in the furnace, E.

108. Fringe Looms; Samuel Walker, Roxbury, Massachusetts.

Claim—1st, Riveting the thread carriers to a reciprocating frame, moving with the lathe. 2d, The guard plates, attached to the knife and operating in the manner substantially as set forth. 3d, Depressing each loop of fringe as it is formed, by means of the fingers, or their substantial equivalents, for the purpose of preventing them from being entangled and twisted up with the succeeding loops. 4th, Twisting the weft thread immediately before the loops of fringe are formed by pivoting its spool upon a revolving carriage.

109. Lathe for Turning Wood; Albin Worth, Stapleton, New York.

Claim—1st, The eccentric, A′, connected with the tool, v, and rotated through the medium of the gearing, q′ r′ s′, or q′ t′ r″ s″, or their equivalents, from the mandrel, a, so as to turn or cut the work in oval or polygo-

nal form. 2d, The combination of the patterns, S T, the eccentric, A′, and cutting tools, p u v, attached to the slide rest, G, and the feeding device formed of the screw, E, and nut, i.

110. MACHINE FOR COILING METAL PIPES; P. D. Weimer, Lebanon, Pennsylvania.

Claim—1st, The coiling of hot or cold metal pipe on a plain cone or cylinder, by means of a movable groove or die. 2d, Feeding the movable groove or die forward, so as to form the coil by means of a pattern coil, or its equivalent, as described.

111. SEWING MACHINES; C. D. Wheeler, City of New York.

Claim—The combination of a sheave whose groove is sharp, or so constructed that the thread may jam therein by a partial passage around the sheave, with an adjustable friction brake to control the movement of the said sheave.

112. ROCK DRILLS; Lyman White and J. T. Bumgarner, Davenport, Iowa.

Claim—1st, The combination of the cam, D, swinging adjustable frame, B, slide bar, E, and screw-rod, G, containing the drill rod, K, arranged substantially as set forth. 2d, The combination of the adjustable plate, J, attached to the frame, B, arm, I, nut, H, with collar, K, and pawl, j, attached. 3d, The spring, u, interposed between the lower collar on the drill rod and the lower end of the screw-rod, for the purpose specified. 4th, Placing the screw-rod, G, on the drill rod, K, between two adjustable collars, t t, so that when the screw-rod has been fed or moved down the distance of its length, it may, by loosening or detaching the collars, be raised on the drill rod and secured upon it higher up in order to continue the work.

113. GRUBBING MACHINE; T. C. Wood, Charleston, Michigan.

Claim—The arrangement of the lever, the hinged supporter, the cord, the elliptical block, and hooks, all being secured in the carriage substantially in the manner specified.

114. LOCKS; Linus Yale, Jr., Philadelphia, Pennsylvania.

Claim—Providing a main bolt or bolts with two or more systems or sets of stops or tumblers, or their equivalents, whether alike in form and construction or dissimilar—commanded by or obedient to one and the same key, or its equivalent, or by separate and distinct keys, or their equivalents, so placed and arranged, whether near or distant, that when its key is applied to either one set, that set shall release the bolt irrespective and independent of either of the other sets.

115. RAILROAD CAR WHEELS; Thomas C. Ball, Assignor to self, L. Bisco, A. S. Davis, K. Crossfield, E. Edwards, and Jacob Green, Keene, New Hampshire.

Claim—(For a car wheel, with an insertion of rubber, or other elastic substances, between the two parts), the making of the rim or tire and its flanch in one piece, for the purpose of strengthening each other. Also, the mode of confining the two parts together, by means of the hook or pivot bolts, to prevent the wear and chafing of any stationary confinement—also, to be at liberty to make each bolt do its share of labor assigned, for castings are most invariably too uneven to get any equality of confinement in other modes.

116. SEWING MACHINES; Samuel Comfort, Jr., Morrisville, Assignor to self and F. H. Jackson, Philadelphia, Pennsylvania.

Claim—The guard, in combination with a bent needle, the inner edge of the said guard being in juxtaposition with the needle, and forming the segment of a circle of which the centre of vibration of the needle arm is the centre, for the purpose specified. Also, causing the needle thread to maintain the needle in proximity to the guard, and at the same time so guiding the thread to coincide with the groove of the needle, by means of the projection, arranged on the said guard.

117. SKELETON HOOP SKIRTS; R. J. Mann, Assignor to L. A. Osborn and J. J. Vincent, Brooklyn, N. Y.

Claim—In the construction of ladies' skeleton skirts, the combination of a series of horizontal hoops, adjustable in diameter with the bands or cards crossing and connecting them.

118. DREDGING CRANE; George Wood and John King, Assignors to selves and Wm. Lawrence, Philadelphia, Pennsylvania.

Claim—1st, The post with its pulley, and the barrel with its clutch, when arranged for joint action on the deck of the vessel, substantially as set forth. 2d, The carrier, with its pulley and its hollow stem, as arranged to turn in the socket in the end of the jib, in the manner specified.

NOVEMBER 16.

119. WASHBOARDS; John Adams, Pittsburgh, Pennsylvania.

Claim—A washboard having its rubber composed of glass, as described.

120. BOMB LANCE; A. F. and J. H. Andrews, Avon, Connecticut.

Claim—The employment of the independent movable fuse tube arranged within a bomb lance, substantially as described, so that the fuse will be ignited by the motion of the missile.

121. KNIFE SHARPENER; Alexander Annan, City of New York.

Claim—The two cutter plates with cut or corrugated surfaces, placed in oblique positions relative with each other, and arranged or fitted between the upright plates of a base, substantially as set forth.

122. INFANTS' CRADLE; Thomas C. Ball, Keene, New Hampshire.

Claim—The arrangement of the cranks, C C, pieces, D D, slot, E, and cross-bar, F, in combination with the spring and gearing.

123. SAFE LOCK; Obadiah Bayly, Jr., Dearborn Co., Indiana.

Claim—The action of niche wheel in preventing the bolt, B B, from being passed back so as to unlock; the application of a movable pinion on the shaft wheel, in connexion with a steel plate and hand, by means of which the lock is set to unlock at any given hour by the niche passing in front of the bolt, B B, and permitting it to pass within the niche, and not until then. Also, the application of security spring, security lever, and security catch, in allowing bolt, B B, to pass back and over the rim of niche wheel, and again securing it opposite the rim of niche wheel when the door is shut. Also, the application of stop levers in stopping the clock when the niche is opposite bolt, B B, by lever, S S, coming in contact with the cogs of wheel of the clock. Also, the application of spring, L, in pressing bolt, B B, against the plate of the works.

124. LATH MACHINE; Josiah Black, Memphis, Tennessee.

Claim—The vibrating table and lever, B, together with mechanism connected therewith for giving change

of motion to carriage, in combination with the lever, B′, and the mechanism for opening and closing the dogs.

125. BEE-HIVES; Asa Blood, Sr., Norfolk, Virginia.

Claim—The main or breeding core, B, in enclosing case, in combination with the honey cores, D, in cap, E, the several parts being constructed in the manner specified.

126. MACHINE FOR MAKING SPOONS; J. P. Brinkerhoff, Brooklyn, New York.

Claim—The arrangement and combination of the rolling die, E, die, G, bolster, F, opening, h, and bar, H, as described.

127. ELECTRO-MAGNETIC FIRE ALARM APPARATUS; Moses G. Farmer, Salem, Massachusetts.

Claim—1st, The dial, the snail, and the key or lifting piece, A 2, in combination with an electric circuit and with the means of making and braking the circuit, for the purpose of striking a definite number of blows upon one or more bells, and of repeating the same, and of registering or indicating the number of the blows so struck. 2d, The arrangement of the circuit lever, l, the lifting piece, A 2, and pin, i 2, so that the circuit shall be closed on the dropping of the lifting piece from off the pin. 3d, The arrangement of the circuit lever, c, rack, w, whereby the circuit is completed by the falling of the rack, and broken when the required number of blows has been struck. 4th, The combination of the circuit levers, l and e, operating in the manner substantially as set forth. 5th, The arrangement of the arm, f, the arms, a and b, or their equivalents, for the purpose of effecting electric communication alternately with the time magnet, D, and the tracing magnet, H.

128. SHOE PEG MACHINE; Azro Brown, West Waterford, Vermont.

Claim—1st, The combination and arrangement of the radial and slotted plate, t, eccentric helical or spiral edged plate, between which and the lower plate, e, it is confined; said lower plate having depressions and gutters in its upper surface for receiving corresponding parts formed on the lower surface of the slotted plate, and a raised or ridged portion nearer its centre, whose inner edge corresponds with the eccentric curvature of the edge of the plate, the said slotted plate and the other parts mentioned being arranged in the manner set forth. 2d, Giving an intermittent progressive motion to the slotted plate, by the combination of the ratchet notches on its under surface, spring pawl, K, and oscillating lever, l, attached by a connecting rod to the pitman rod. 3d, Forcing or conveying the strips of wood from which the pegs are formed after being cut from the block or bolt, by means of the combination and arrangement of the traversing bars guided by wheels on the end of the cross-head, at the angle where they are connected, curved groove, V, in the drum, P, and knives, W, between which the strip is first deposited and subsequently conveyed through the slot in the rim of the plate or rim, and under the V-shaped cutter. 4th, The combination of the cylindrical knife and cutters, as described.

129. DEVICES FOR SAVING THE SEED FROM HAY FED TO STOCK; R. A. Campbell, Salem, Indiana.

Claim—The combination of the inclined conductive passage, intermediate hay rack, and sieve bottom trough, substantially as set forth.

130. MODE OF CONNECTING ELECTRO-MAGNETIC APPARATUS WITH TOOTH FORCEPS; J. J. Clark, Philadelphia Pennsylvania.

Claim—The employment of the foot-key, or its equivalent, in combination with the electro-magnetic machine and forceps, arranged as described.

131. BILLIARD TABLE; H. W. Collender, City of New York.

Claim—The manner of applying steel springs as cushions to billiard tables, by clamping the lower portion thereof to the edge of the bed. Also, making the height of the cushions above the bed of the table, adjustable, that they may be adapted to balls of different diameter. Also, combining with the bed and cushions, a flanch or ledge outside of the cushions on a level with the bed, or nearly so, to form a rest for the hand when playing with the ball near to the cushion, as set forth.

132. POWER LOOMS; John Crawshaw, Rochester, New York.

Claim—1st, The lever, applied in combination with the cloth roll and with the spring of the take-up lever, to operate substantially as described. 2d, The rock beam, its arm, and pawl, applied in combination with the ratchet wheel, screw, and lever or levers, and weight or weights, to move said weights toward the fulcra of the friction strap lever, as the quantity of yarn on the yarn beam is reduced.

133. SEALING PRESERVE JARS; R. M. Dalby, Mount Washington, Ohio.

Claim—The yoke or ring, in combination with the leather, or its equivalent, as applied to vessels, substantially as described.

134. BURNING COAL DUST; G. B. Deppen and E. Devengood, Myerstown, Pennsylvania.

Claim—In combination with a fan-blower to promote combustion, the arrangement of the fire chamber, ash-box, perforated plates, combustion and exit chambers, communicating with each other and with the air trunk leading from the fan-blower.

135. SAFE LOCK; Leger Diss, Utica, New York.

Claim—The combination of the reciprocating stop-holder with the levers, stops, and the compound slotted tumbler, the construction being as described.

136. VAULT LIGHT; Cornelius Donaldson, City of New York.

Claim—The annular flanch on each glass, in combination with the supporting plates and the ring packings of rubber, or equivalent material, in substantially the manner specified.

137. VEGETABLE CUTTER AND COFFEE MILL COMBINED; B. Essig, Pittsburgh, Pennsylvania.

Claim—The mode of arranging and combining a vegetable cutter and a coffee mill in such a manner that by means of the sliding shaft, either of the two may be set in or out of gear.

138. STRAW CUTTERS; Wilson Green and Malcolm McFisher, Chattanooga, Tennessee.

Claim—The arrangement of the treadle, leather strap, the regulating board, and knife, combined with the double-leafed lever, C, lever, E, and upright standard, for joint operation, as described.

139. HAND HAMMERS; Alfred Gregory, Washington City, D. C.

Claim—The heft regulating "hammer shaft" or helve, operating to secure to the implement, of which it forms the handle, an enlarged and variable capacity to deal light or heavy blows, as required.

140. ASTRONOMICAL INSTRUMENT; Henry Glover, City of New York.

Claim—1st, The use of the double reflectors or mirrors, in combination with a vertical sight, whether

the said mirrors are fixed or made adjustable. 2d, The second graduated arc, in combination with the main instrument and with the second mirror, in the manner set forth. 3d, The supplemental arc, in combination with the level and with the main instrument, in the manner set forth.

141. Centre Boards for Vessels; Jesse F. Potts, Apalachicola, Florida.

Claim—The two or more hinges or parallel bars, when arranged in the manner set forth.

142. Binding Attachment to Harvesters; Wm. Gray, Nicholsville, Ohio.

Claim—1st, The arrangement of gravitating platform and series of levers with their accessories, in connexion with a drive wheel for the automatic starting of the binding mechanism by the weight of the sheaf or gavel. 2d, In this connexion, the talons, constructed and operating substantially as set forth. 3d, In combination with the talons, or their equivalents, the crane and its accessories, having the described compound movement. 4th, In the described combination with the talons, or their equivalents, the pliers, constructed as set forth. 5th, The rod, "looper," and "tucker-in," constructed as set forth.

143. Automatic Feed-boxes for Animals; Albert Goodyear, 2d, Hamden, Connecticut.

Claim—The arrangement of the box, lid, spring, and catch, with sliding plate, dial, notch, and button, united together in the manner set forth.

144. Harvesters; Stephen Hall, Poughkeepsie, New York.

Claim—Connecting the inside shoe to which the finger bar is fastened directly to the main frame, or to one or both the end bars of the main frame, by means of circular bearings at each end of the shoe, without any coupling piece, in combination with a small wheel hinged to the inside shoe. 2d, The notches, holes, or slots in the shoe and flanches near the bearings or joints on which the shoe turns, in connexion with the movable catches or bolts that work in them to keep the finger bar in its proper place, or from rising or falling too much over uneven ground, in combination with a jointed shoe, constructed as represented. 3d, I do not claim simply attaching a wheel of any kind to the inside shoe—but I claim the arrangement of the small wheel, with the jointed frame or bar hinged to the inside shoe, by which the wheel is allowed to remain in the same position when the finger bar is turned up to go from place to place, as it is when the machine is cutting grass, and the finger bar rising and falling over uneven ground.

145. Animal Traps; C. Jillson, Worcester, Massachusetts.

Claim—A rat or animal trap in which the jaws are moved from each other in a plane, and thus enlarge the opening between them, and which, when tripped, shall close up or contract the said opening, substantially as described.

146 Horse Power Draft; J. Herva Jones, Rockton, Illinois.

Claim—The combination of the levers and the flexible link, in the manner set forth.

147. Breast Pipes; Thomas Lewis, Malden, Massachusetts.

Claim—The described combined nipple shell and breast pipe, constructed by the attachment of a neck and pipe to an ordinary nipple shell.

148. Method of Registering the Speed of Railroad Trains; Charles T. Liernur, Mobile, Alabama.

Claim—1st, In the indicating apparatus, the governor, placed in the lower part of a casing, which can be used as a car seat, said governor having its weights so united by connecting rods and levers as to cause them to remain in their centrifugal and centripetal action, uninfluenced by any horizontal jars and shocks of the car. 2d, The compensation beam, or its equivalent, with its rods and levers, to bring over the motion of the cross-head of the governor to the indicator, so arranged as to cause the vertical jolts and jars received by the various moving parts to absorb one another, and the indicator which points out the degrees of speed on the index, the whole so arranged as to enable the passengers and conductors to be constantly informed of the exact speed of the train. 3d, In the registering apparatus, I claim the circular register of metallic or other paper, with its radiating and circular lines expressive of distance and speed, said register receiving any degree of retarded motion from the car axle by means of the worms, and the worm wheels, and the pencil-holder with its adjustable pencil, the whole so arranged that the various degrees of speed on all parts of the road shall be noted down on the circular register.

149. Telegraphic Instrument; Rufus Kendrick and Alpheus W. Arkerson, Cambridgeport, Massachusetts.

Claim—The application to the finger key of a telegraph instrument of a rocking shaft, or its equivalent, to which a succession of vibratory motions of the proper proportionate durations for producing the characters required is communicated. Also, the construction and arrangement of the rocking shaft with its dogs, and of the keys, operating in combination substantially as set forth.

150. Machine for Sawing and Planing Shingles; George H. Mallory, City of New York.

Claim—The particular means employed for adjusting the bolt to the saw, in order to give the taper form to the shingle, in combination with the means employed for adjusting or moving the planer to its work, to wit: the bars, connected as shown, by the pendant and set-screws operated by the wiper and pins, and attached respectively to the bar containing the jaws which hold the bolt, and the bar connected with the planer head.

151. Harvesters; James S. Marsh, Lewisburgh, Pennsylvania.

Claim—The arrangement of the bent lever and the arm of the caster wheel, when said lever is pivoted behind, and said arm is pivoted before the axle of the driving wheel, and the two are connected by the link.

152. Tongs for Coal, &c.; James M. Meschutt, City of New York.

Claim—The metallic tongs for coal fires, &c., constructed with fingers or curved prongs and the projections, for the purpose of preventing the fingers coming too closely together.

153. Hand Drills; Frederick McNair, Fultonham, Ohio.

Claim—The arrangement of the feed-screw, and sliding gate, and frame, in combination with the adjustable bed, as described.

154. Washboard; John Miner and Silas Merrick, New Brighton, Pennsylvania.

Claim—So impressing the corrugations equally upon both sides of the plate, that the medial or central line of the corrugated part of the plate may be in a line with the plane border, and that the ribs shall project equally on both sides, forming two equally good washing surfaces, as set forth.

155. Melodeons, &c.; Isaac Rehn, Philadelphia, Pennsylvania.

Claim—1st, The employment of independent wind chests in melodeons, harmoniums, and other similar reed instruments, in combination with the suction bellows, for the purpose specified. 2d, The introduction

of the stop valves between the independent wind chests and the bellows, in combination with the appliances described, or their equivalents, for operating the said valves, when the said appliances are situated within the bellows.

156. CHURN; Harry and Royal V. Robie, Eaton, New York.

Claim—The perforated beater, in combination with the alternate beater, presenting a concave extremity in connexion with the passage formed by the narrow base of the beaters, the several parts being constructed and arranged upon the shaft with respect to each other, in the manner set forth.

157. MOULD FOR GLASS BOTTLES; Samuel S. Shinn, Lancaster, New York.

Claim—The mould constructed with its stationary portion of clay, plaster, or material of similar character, clamped between plates, and the opening portions of metal hinged to the upper clamping plate, substantially as set forth.

158. FORGE HAMMERS; Benjamin Shiverick, Pittsburgh, Pennsylvania.

Claim—The cam, so constructed as to act on the collar opposite the spindle, or nearly opposite the spindle during the whole time of its action in raising the hammer, except when the extreme end of the cam is passing out from under the collar to let the hammer drop. Also, a wedge, or its equivalent, so constructed and arranged as to be moved by the workman or attendant while the hammer is in motion, to graduate the action of the springs upon the hammer, to make it strike light or heavy blows, as desired.

159. CHURN; Charles W. Stafford, Burlington, Iowa.

Claim—The general arrangement and adaptation of parts, substantially as set forth.

160. BREECH-LOADING FIRE ARMS; John C. Symmes, Watertown Arsenal, Massachusetts.

Claim—The elastic flexible lip, substantially as described, however it may be applied to checking the escape of gas from the breech of breech-loading guns.

161. MACHINE FOR MOULDING BOOT AND SHOE SOLES; Daniel J. Tapley, Danvers' Centre, Massachusetts.

Claim—1st, Providing the lower former with a socket to receive the upper end of the wooden standard, and also with projecting ears to guide the rods and holes in the back flanch, to admit screws for confining the machine to a bench or the side of a shop. 2d, The combination of the spring, lever, and connecting guide rods, with the upper former, substantially as set forth.

162. HAME FASTENER; John Tingley, Potter Co., Pennsylvania.

Claim—The combination of two hooks coupled together by a semi-revolving force plate, and the spring, the catch, and the projection, when made and combined substantially as set forth.

163. SHIP-BUILDING; Daniel Vrooman, Hudson, Ohio.

Claim—The arrangement and combination of the inclined surfaces or projections, and the elastic fins or wings, with the hull of the vessel, substantially as described.

164. LOCOMOTIVE LAMP CASE; Irvin A. Williams, Utica, New York.

Claim—The combination of casings, B and C, with the chimney, A, the plates, p and p', alternating, and the construction and arrangement of the several parts, substantially as set forth.

165. INSTRUMENT FOR TRIMMING THE EDGES OF BOOT AND SHOE SOLES; Isaac Rich, Assignor to Samuel C. Arnold, Manchester, Connecticut.

Claim—The described instrument, consisting of the handle, guard, knife, and sliding gauge.

166. SPRING BED BOTTOM; Noah Warlick, Chambers' Court House, Alabama.

Claim—The wooden springs attached to the under side of the longitudinal slats, and resting on the transverse bar. Also, the use of metal or india rubber springs resting upon said transverse bar, for the purpose specified.

167. BRAIDING MACHINES; Andrew B. Clemons, Derby, Assignor to the Birmingham Iron Foundry, Birmingham, Connecticut.

Claim—Combining and arranging the tension and pawl blocks or weights, which have a rising and falling movement over the vertical guide bar in relation to the lower eye in the bar, E, and the bobbins, described, for regulating the paying out of the thread from the bobbin, and consequently its tension, in the manner set forth.

168. MACHINE FOR CUTTING BUNGS; James Lyon and George H. Brady, Assignors to selves and Thomas J. Falls, Jr., City of New York.

Claim—The cutters and stocks sliding in the adjustable blocks that are revolved by the face plate, and which cutters are projected by means of the disk, and act to cut a tapering bung.

169. RAILS FOR RAILROADS; John Cochrane, City of New York.

Claim—The making or forming of such rails by means of rolls, with additional metal upon the crown or head thereof, which additional metal is forced into the head or top part of the rail by a second process, thereby consolidating the head or top part of the rail, and hardening the bearing surface thereof, substantially as described.

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170. REFRIGERATOR; Abel H. Bartlett, Spuyten Duyvil, New York.

Claim—The wedge form and position of the ice and water receptacle, dividing the provision chambers, arranged as specified.

171. SASH FASTENER; John Bostwick, Jr., Dedham, Massachusetts.

Claim—A sash fastener having an independent eccentric and an independent bolt, combined as described.

172. TRUSS BRIDGES; John C. Briggs, Concord, New Hampshire.

Claim—The application of india rubber, or equivalent springs, to the compressed joints of truss frames and truss beams, substantially in the manner described.

173. DEVICES FOR CLAMPING AND FEEDING THE BOLT IN FELLY SAWING MACHINES; Derwin E. Butler, Chesterfield, Ohio.

Claim—1st, The bed, arranged with the rods and arms, connected by the bar and the spring, for the purpose of readily operating the bolt for feeding and removing the same from the saws. 2d, The jaw, formed on

the bent bar attached to the bed and spring, so that the jaw may be operated to grasp the bolt, and the bolt relieved therefrom by the movement of the bed, substantially as set forth.

174. Machine for Splitting Leather; Henry E. Chapman, Albany, New York.

Claim—The arrangement of the dished circular knife, the series of split springs, and the sliding bed, in their relation to each other, as described.

175. Apparatus for Heating and Ventilating Buildings; Wm. H. Churchman, Janesville, Wisconsin.

Claim—The arrangement and combination of the induction and eduction flues or venti-ducts, K K′, the continuation flue of the venti-ducts, K′, the damper, and the registered openings, whereby any number of the rarifying drums, with their accompanying venti-ducts, may be used at pleasure, either for warming or ventilating alone, or for both at the same time, as described.

176. Method of Regulating the Winding of Time-keepers; Jonathan Dillon, Washington City, D. C.

Claim—The described method of making springs or coils self-regulating, by the use of the slot and lever, or by any other similar device.

177. Blacksmiths' Tuyere; Benjamin E. Dixon, Marshall, Michigan.

Claim—The mode of regulating the length of the discharging orifice in a water tuyere, by means of the oblong tapered wind chamber, with grooves, or other equivalent device, in its casing, in combination with one or more of the tapered plugs, rods, and the detachable cover, to be used for the purposes described.

178. Chimney Caps; Charles Douglas, Cleveland, Ohio.

Claim—The frame, the valves, the cap, and the plan of linking the valves and cap together, to give them their proper relative positions, as described.

179. Machines for Breaking Stones for Ballasting Railroads and Turnpikes; A. C. Ellithorpe and Ives Scoville, Chicago, Illinois.

Claim—The cylinders constructed with a solid base and sectional shell, when the said shell is made in segments, and dovetailed and secured together, and dressed with teeth shaped and set as described, and when the said cylinders are used for breaking stone for Macadamizing or ballasting railroads, &c., substantially as set forth.

180. Picker Staff for Looms; Samuel Estes, Newburyport, Massachusetts.

Claim—The arrangement of the picker staff with the guide, with respect to the outer end of the passage, substantially as described.

181. Mode of Baking Articles Composed of Carbon; DeGrasse B. Fowler, City of New York.

Claim—The manufacture of articles from a composition of carbon and gas tar, or their equivalents, when treated with pressure and heat, and baked in the presence of lime, substantially in the manner described.

182. Gearing; G. B. Gansher, Reading, Pennsylvania.

Claim—The arrangement on the wheels, E and F, of the plates, A A′ A″, rollers or wheels, B B B, plates, D D′ D″, and collars, O O O, the whole being constructed and operating in the manner specified.

183. Straw Carriers; Carlos W. Glover, Farm Ridge, Illinois.

Claim—In combination with a series of bars having the motions described, the spring shield for aiding to guide the stalks or other thing conveyed thereon, and for preventing their falling back or becoming entangled.

184. Gearing; Ebenezer A Goodes, Philadelphia, Pennsylvania.

Claim—Providing the wheels respectively with spiral projections and spiral grooves, substantially as described.

185. Brick Moulds; James A. Hamer, Reading, Pennsylvania.

Claim—The two crank rods, or their equivalent, as connected with the followers and secured to the frame, and as operated upon by the hand piece.

186. Cooking Ranges; Joshua Harrison, City of New York.

Claim—The arrangement and combination of the flues, C and F; with the breaks or parts, G 1 and 2, substantially as described, and the dampers in connexion with the main flues, F F, directly underneath the fire, for the uses and purposes set forth. Also, the arrangement of the broiling grates with the flue, for the purpose of applying the heat of such fires directly to, and making it effective in, heating that part of the range most distant from the principal fire. Also, the construction and arrangement of the top plate, as described, by which the front and back rails are made a part of the body of the range, while the central part of such plate is made in separate sections, the back rail being also a base or foundation for the mason work, as set forth.

187. Cooking Stoves; Richard M. Hermance, Stillwater, New York.

Claim—The arrangement of the flue strips in the chamber, in combination with the fire-box, descending flues upon the sides of the stove, and oven flues under and back of the oven and exit pipe, arranged and operating together substantially as set forth.

188. Screw Wrench; Joseph Hyde, Troy, New York.

Claim—1st, The arrangement of the thumb-piece and the screw, in the manner and place described. 2d, Making the sliding jaw, E, in two equal parts, divided on a vertical line parallel with the bar, D, and the jaw, L, so as to cast the nut and the recess at the same casting of the said sliding jaw.

189. Inkstands; Orlando H. Jadwin, Carbondale, Pennsylvania.

Claim—In combination with a hollow plunger for raising the ink, an independent cup for holding said ink, and from which it cannot, by the ordinary want of tightness, flow back into the reservoir.

190. Tournures; Benjamin Johnson, Philadelphia, Pennsylvania.

Claim—A curved elastic projection or support, consisting of the springs and webbing, or their equivalents, when the said springs are constructed, arranged, and fixed to a waistband, so as to be held out thereby free from the under garments and person, as described, that they may operate in connexion with the webbing, substantially in the manner described.

191. Method of Neutralizing Local Attraction of the Needle; Calvin Kline, Brooklyn, New York.

Claim—Applying and arranging the magnet or magnets in a horizontal position or positions below or

above the needle of the compass, with opposite poles in the vertical plane of the axis about which the needle turns, and on opposite sides thereof, and in such a manner as to be adjustable on centres lying in, or as nearly as practicable in, the vertical axis about which the needle turns, that their poles may be made to point in any direction necessary to compensate for local attraction, and have such direction varied as may become necessary.

192. Furnaces for Evaporating Sugar Juice; Louis Lefebre, New Orleans, Louisiana.

Claim—In combination with the fluted outer surface of the kettle, forming the masonry constituting the opposite face of the flue with corresponding flutings or corrugations, so as to surround the kettle with an undulating passage for the products of combustion.

193. Refrigerator; Adolphus Lipmann, City of New York.

Claim—The described arrangement of a series of coiled pipes which emanate from the ice chamber, and which are carried down between the two walls of the refrigerator to a central coil.

194. Smut Machine; Hugh Marshman and Charles F. Foulke, Carlisle, Iowa.

Claim—1st, The combination and arrangement of the casing and funnel-mouthed opening, the parts being so arranged in relation to each as to, at the same time, give a converging descent to the grain, and an inward partially downward blast through it at that point. 2d, The introduction of an auxiliary blast into the upper portion of the horizontal trunk, as described, by which a more perfect separation of the light grain is secured.

195. Moulds for Making Bottles; John L. Mason, City of New York.

Claim—The combination of the screw thread with the rim, f, and also its combination with the rim, r, for the purposes set forth. Also, the combination of the grooves in the female screw of the mould, with the air passages through the mould, for the purpose set forth. Also, the blower-over, in combination with the moulds for the necks of bottles. Also, a flanch above the blower-over, as described.

196. Ore Separator; L. Stadtmuller, Bristol, Connecticut.

Claim—The apparatus described for sizing ores, constructed as specified.

197. Saddle-trees; Jesse Nece, Philadelphia, Pennsylvania.

Claim—1st, Rounding the under side of both the pommel and cantle of a wooden saddle-tree where they bear on the side pieces, and employing, in combination with the whole, the side strips, so that the said side pieces may be free to vibrate on their hinges, and still retain their proper relative position with regard to the pommel and cantle. 2d, The metal arch pieces secured to the pommel and cantle of the saddle-tree, as described.

198. Farm Gate; Wm. Newlone, Penn Yan, New York.

Claim—1st, The combination of the post and hinges, constructed as described. 2d, The chain, or its equivalent, with the means for adjusting the same, as specified. 3d, The catches and latch, combined with the means for actuating the same, as arranged in the specification.

199. Preserving Surfaces of Cast or Wrought Iron; Charles Francis Leopold Oudry, Paris, France.

Claim—1st, The employment of a varnish, or of successive varnishes, insulating, metallizing, and intermediary, between the object to be coated with copper—whether the same be metallic or non-metallic—and the protecting copper itself, all or a part of said varnishes being composed of certain metallic substances united with fat or essential oils, and gummy, resinous, bituminous, or asphaltic substances. 2d, The coating of all kinds of objects with copper, by the employment of one or several varnishes in succession previous to the galvanic coppering obtained directly in a bath of sulphate of copper, i. e., without the intervention of a bath of cyanide of copper.

200. Bustles for Ladies' Dresses; George V. and Edwin A. Pierce, City of New York.

Claim—The springs, a a, fitted into a bishop or bustle, in combination with a lining or strap, forming a straight line of connexion between the ends of said springs, for the purposes set forth; and in combination with said springs, a a, fitted into a bishop or bustle in the manner specified, we claim the springs, c c, arranged and acting in the manner described. Also, the strap, f, or tape, in combination with the springs, a a, and bustle, substantially as specified.

201. Grate Bars; Silas T. Savage, Albany, New York.

Claim—The employment of the bar, a, when provided with a series of flanches which form an arc above the bar, and which taper from the extremities of the chord of said arc, to or near the bottom of the bar, and thus supporting the coal in arches above the bar, and at the same time strengthening and sustaining the bar by the tapering sides of the flanches.

202. Knitting Machines; Frederick Schott, Brooklyn, New York.

Claim—1st, The combination of the levers, G and H, the dog, G′, spring, k, sliding bar, I, adjustable stops, K′ K, and the eccentric, H′, or its equivalent, on the main shaft, the whole operating to effect the movement of the needle bed in one and the other direction alternately. 2d, The two-grooved safety guide, applied in combination with the feeder, to operate substantially as specified. 3d, The needle and stitch hook protector, applied as set forth. 4th, The combination of mechanism to operate the sinker or reliever, consisting of the cam on the main shaft, the arm and spring on the rock shaft, the spring applied to the reliever bar, the projection on said bar, the stationary inclined projection on the frame, and the stationary inclined planes, as set forth. 5th, The combination of the bar, X, or its equivalent, furnished with teeth, and a wedge-like projection, the pawl operated by the movement of the needle bed and the stop lever, the whole applied to operate in combination with a belt-shipper, to stop the machine as soon as any desired number of courses have been knitted.

203. Machine for Printing Names or Directions on Packages, &c.; James Spencer, Toronta, Canada.

Claim—The application of common type arranged in a form upon a plane bed, to the printing of successive names, numbers, or addresses, one at a time, upon papers, pages, books, tickets, or other articles requiring to be printed, marked, or addressed; and the construction of the machinery, as described, or any similar combination of machinery for producing the same motions, causing the bed to traverse so as to bring all the names, numbers, or addresses in the form successively under the aperture in the tympan, and causing the matter placed under the platen to receive the desired impression.

204. Sewing Machines; James H. Spencer and Thomas Lamb, Philadelphia, Pennsylvania.

Claim—1st, The vibrating or reciprocating carrier with its permanent projections, yielding projections, and spring-retaining catch, in combination with the shuttle plate, its casing and spool, when the several parts are constructed substantially as described, and when they are arranged in respect to each other and to the lip, as set forth. 2d, We do not claim, broadly, feeding the fabric by the combined vertical and lateral motion of a roughened surface feed bar on the said fabric, as such a device is described in the patent of A. B. Wilson,

granted December 19th, 1854. But we claim the arrangement of parts described, for feeding the fabric and regulating the amount of the feed, that is to say, the cams, spring rod, arms, the rod, its collar, and adjustable nut 3d, The cylinders, 3 and 4, with their respective pins, when arranged in respect to each other, to receive the folds of the needle thread so that by turning one or both of the said cylinders, the pins may cause more or less of the folds to bear against the surface of the cylinder.

205. WIND MUSICAL INSTRUMENTS; C. J. Van Oeckelen, City of New York.

Claim—1st, The application to a musical instrument of several different rows of reeds, combined in such a manner that each key of the instrument can produce several different sounds, by causing one or several reeds to vibrate according to the pleasure of the performer, preserving always, nevertheless, the proper musical expression of the note, in the manner substantially as described. 2d, The arrangement of the several parts in such an instrument by which the power is obtained of causing each note to vibrate on itself, and independently of all the others, in the manner substantially as described. 3d, The application to a musical instrument, the sounds of which are produced by the vibration of reeds of several rows of valves, so arranged as to act one upon the other, and that the valves of the different rows thus connected can be opened either all together or only one or more at a time by touching the same key of the instrument at the pleasure of the performer, preserving always, nevertheless, the proper musical expression of the note.

206. MANUFACTURE OF SEWING NEEDLES; Henry Walker, Alcaster, Warwickshire, and Gresham Street, London, England; patented in England, May 19, 1858.

Claim—Forming the eyes of needles in the cylinder of the wire, without flattening the same, by means of the double grooves.

207. THRESHING MACHINES; M. D. Wells, Morgantown, and Harrison Hagans, Brandonville, Virginia.

Claim—The combination of the bifurcated spikes of the cylinder with the peculiarly notched ribs of the concave, operating together as described.

208. PARASOLS AND UMBRELLAS; Edward Young, Philadelphia, Pennsylvania.

Claim—The combination and arrangement of the stationary tube with the swivel rod, substantially as described.

209. SEWING MACHINES; H. W. Harkness, Assignor to self and W. H. Nettleton, Bristol, Connecticut.

Claim—Feeding the cloth to sewing machines by the combined action of a smooth reciprocating pressure foot and a vertical clamp, acting at the end of said foot to hold the cloth firmly while being moved, the bend or angle thus formed in the said material enabling the feed to act with but little pressure on the goods from the smooth foot-piece, as specified.

210. GRAIN AND FRUIT DRYERS; Charles A. Haskins and G. Macardle, City of New York, Assignors to Joshua A. French and Eliza C. Tyrrell, Jersey City, New Jersey.

Claim—The traveling pipes and adjustable drums, and the form of the drums through which the hot air is compressed and distributed over and through the material to be dried. Also, the carriage and seats upon which the drums are adjusted, supported, raised, and carried, in combination with the pipe journal, gear wheel, and chamber.

211. RECLINING CHAIR; A. E. Kendall and P. K. Keyes, Assignors to selves and C. W. Elton, New York.

Claim—In combination with the swinging post, jointed arm, and back, the employment of a serrated segment and fastening, constructed and operating substantially as set forth.

212. LOCKS; Wm. Moore, Brooklyn, New York, Assignor to G. L. Cameron, Chester, C. H., South Carolina.

Claim—As an improvement on my said patent of September 14, 1852, the check tumbler, and spring, in combination with the tumbler that is acted on from both key-holes.

213. COOKING STOVES; Gibson North, Assignor to North, Chase & North, Philadelphia, Pennsylvania.

Claim—The arrangement of the grooved back of the fire chamber, the cold air chamber in the flue, and the guard plate at the corner of the oven.

214. SEWING MACHINES; James Perry, Assignor to Isaac C. Noe, New York.

Claim—The combination and arrangement of the levers and cams for imparting the three reciprocating movements to the looper, namely, that in the arc of a circle, the lateral, and the vertical, in the manner described. Also, the shield, in combination with the looper and needle, arranged and operating in the manner described, for the purpose of presenting the loop to the looper with greater certainty.

215. MACHINE FOR MAKING ENVELOPES; M. G. Puffer, Assignor to Cyrus White and L. A. Corbin, Rockville, Connecticut.

Claim—1st, The shape essentially of the cams, for the purposes set forth. 2d, The employment of the jack, F, arm, C, operating as described, to paste and lift the paper, and the fly to separate it therefrom on to the carrier. 3d, The carrier, shaft, fingers, arm, stud, catches, and arms, for the purpose as described. 4th, The combined action of the bed with the plunger, for the purpose as described; also, the employment of the springs in the plunger. 5th, The folding flaps projecting from the centre, or nearly so, from the end of a shaft or shafts, and having their bearings on one end or on each end thereof, whether with or without the half circle. 6th, The construction and arrangement of the catch wheel with a long tooth and guard, for the purpose as described. 7th, The arrangement of the nippers, operating in the manner described.

216. MACHINES FOR TARRING ROPE YARN; John Stewart, Assignor to Charles Wall, Brooklyn, New York.

Claim—The employment within the tar vat of one or more series of sheaves or conductors over or round which the yarns are bent, in the manner described, to open their fibres, and make them pass and return in an opposite direction through the tar, for the purpose set forth.

217. APPARATUS FOR BORING WELLS; I. M. Butler, Oxford, Mississippi.

Claim—The square-chambered auger, constructed substantially as set forth.

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218. KETTLES FOR TRYING OILS; J. L. Alberger, Buffalo, New York.

Claim—A horizontally placed cylindrical boiler or tank surrounded by a steam-jacket, or having the steam admitted directly into it, when said boiler or tank is capable of being turned over in its cradle, and have all its contents run out at the man-hole—and this I claim whether said boiler be used in connexion with a condenser or without it.

219. CURTAIN FIXTURES; Thomas C. Baldwin, Newton, Massachusetts.

Claim—The detaching chamber and passage, in their combination and arrangement with the journal bearings of the two bearing blocks, and with the rotary friction ratchet, its spring and the pulley being arranged at one end of the curtain roller. Also, the arrangement of the rotary friction ratchet spring and the pulley at one and the same end of the curtain roller, or so that the said ratchet may turn on the journal projecting from the said pulley, in manner described.

220. TACKLE BLOCK; W. B. Barnard, Waterbury, Connecticut.

Claim—A tackle block having its bushing secured and adjusted to the pulley by means of a nut.

221. TOOL FOR CUTTING KEY SEATS IN WHEELS AND PULLEYS; James Barton, Cleveland, Ohio.

Claim—The employment of the shaft provided with a series of cutters which are adjustable, the two being so arranged that by pressing them through the hole or bore of a wheel or pulley, a key seat is finished parallel with the bore. Also, the employment of a tapering circular step or wedge between the cutter shaft and the bore of the wheel or pulley on the opposite side from the cutters while the key seat is being cut, for the purpose of cutting a tapering key seat.

222. SEED PLANTERS; James F. Beckwith and Adin G. Gage, Alabama, New York.

Claim—1st, The combination of the raising lever, when arranged with the marking wheel. 2d, The combination of the cranks on the axle of the marking wheel, when arranged with the markers, whereby the exact positions of the measuring recessess in the seed deliverer are indicated to the driver.

223. PIPE TONGS; James R. Brown, Boston, Massachusetts.

Claim—In the crossed lever jaw pipe tongs, the arrangement and application of the adjusting screw with reference to the fulcrum pin, the slot, and the hooked jaw lever.

224. PHOTOGRAPHIC PLATE SHIELD; Henry Bryant and R. D. O. Smith, Washington City, D. C.

Claim—The application of the bent wire, or its equivalent, for the purpose of opening and closing the door on the inside of the camera, in the manner described.

225. SCISSORS; Joel Bryant, Brooklyn, New York.

Claim—The exclusive use of scissors when provided with a spring or springs connecting with the rivet and blades, substantially as described.

226. APPARATUS FOR ASSORTING EGGS; Henry Burt, Newark, New Jersey.

Claim—The arrangement of the perforated surface, for receiving the eggs and excluding the light. Also, the mirror, in combination with the above, arranged substantially as specified.

227. FIRE ENGINES; Lysander Button and Robert Blake, Waterford, New York.

Claim—Placing the cylinders diagonally to the line of the rock shaft, in the manner set forth. We do not claim contracting the air vessel at its base or its point of attachment to the water ways or channels of fire engines. But we claim combining with the horizontal water way or channel, the air chamber, divided into two compartments by the contraction at or about one-half the height of said air chamber above its base or point of attachment to said water way. Also, in combination with the hour glass contraction of the air chamber, the ring enlargement of the rock shaft, as set forth.

228. EXTENSIBLE LIFE RAFT; Calvin Furbush, Kittery, Maine.

Claim—The combination of the diagonal braces, sleeves, and guide bars, with the tubular floats, in the manner set forth.

229. SEWING MACHINES; S. S. Burnet and Wm. Broderick, Chicago, Illinois.

Claim—1st, The employment of the rocker, in combination with the cranks of the driving shaft, and the needle bar or slide for giving the required motions to the needle bar to accomplish the formation of the loop, and simultaneously allow the shuttle time to pass through the loop before the loop is drawn tight, and thereby accomplish the interlocking of the two threads, and the drawing of the stitch tight on the cloth. 2d, The employment of an auxiliary adjustable thread guide, in combination with the rocker and stationary thread guide, for the purposes of governing and adjusting the amount of thread for each stitch. 3d, The employment of the segment friction plate hung on a horizontal axis with or without index pointer, in combination with the thread guides, for the purpose of causing a greater or less tension upon the upper or needle thread. 4th, The employment of a vertical sliding unyielding pressure bar, formed of two pieces, which are right and left screw-tapped, and coupled together by an adjustable link nut, in combination with a jointed, pivoted, feeding and holding-down pad, and a vertically and laterally-acting cam of the rocker, in the manner substantially as specified.

230. HARVESTERS; Nicholas Clute, Dunnsville, New York.

Claim—The construction and arrangement of the several parts, for the purpose of allowing the ends of the rakes to pass over and around the reel, in the manner specified. Also, the pulley when arranged to tip or vibrate the rake teeth at the top of the inclined plane, and release the grain and straw, and let it fall into the trough or box.

231. CUT-OFF VALVES FOR STEAM ENGINES; J. M. Colman, Milwaukie, Wisconsin.

Claim—The arrangement and combination of the flap valves, valves, jointed toes, rods, levers, and governor, as described.

232. PUMPS; Asahel Cooley, Springfield, Illinois.

Claim—1st, The parts composing the piston and its valves, when combined with the hollow piston rod, as described. 2d, The parts, H K and I, constructed as described, when combined with the hollow piston rod.

233. HOSE COUPLING; James C. Cooke, Middletown, Connecticut.

Claim—The female parts in combination with the male parts, arranged for the purpose specified.

234. ARRANGEMENT OF CUTTERS FOR TURNING HUBS; George Cooper, Berlin, Wisconsin.

Claim—The arrangement in the same machine of the adjustable preparatory and main cutter stocks furnished with suitable cutters, in combination with any ordinary turning lathe or revolving centering shaft.

235. MODE OF SECURING THE ENDS OF RAILWAY BARS; Christian E. Detmold, Orange, New Jersey.

Claim—The mode of joining rails at their ends to form continuity thereof, without the use of chairs or plates, bolts or rivets, or of any other fastenings, by inserting iron joint pieces of such shape as to fit into slots in the shanks of two contiguous rail ends, and at the same time afford a support to the head of said rails,

whereby the rails are permanently kept in the same vertical and horizontal planes, and are allowed to expand and contract, substantially as set forth.

236. Ash and Garbage Safe; William Gee, City of New York.

Claim—The combination in a close case of the two chests, with rollers and arms extending from foot attached to the case, the top being ornamented; also, the mode of securing the said chests and case, as described.

237. Machine for Making Window-blind Slats; Isaac W. Gere, South Granby, New York.

Claim—A machine that will take a rough slat as it comes from the bolt, and automatically pass it along to and past the series of mechanical devices that will plane, dress, and form the tenons thereon, and complete the slat before it leaves the machine.

238. Furnaces of Steam Boilers; F. P. Dimpfel, Philadelphia, Pennsylvania; patented in England, May 24th, 1856.

Claim—The passages through the water spaces entering the combustion chamber or extension of the furnace. Also, the means for providing for the perfect consumption of the finer particles of fuel and products of combustion, as set forth.

239. Steam Trap; Frank Douglas, East Liverpool, Ohio.

Claim—1st, The arrangement within the box of the horizontal cylindrical chamber, the two disk valves, with their interposed adjustable stem, the levers, and connexions of said levers, with the float. 2d, The spherical float guard applied within the box, and in relation to the inlet passages, as set forth.

240. Seeding Machines; Warren Drummond, Woodbridge, New Jersey.

Claim—The elastic rollers arranged relatively with the slides, to operate as set forth.

241. Blind Operator; L. N. Fay and Wm. Mason, West Warren, Massachusetts.

Claim—The spirally flanched plate and worm-wheel, when attached to the sill and used in connexion with the slotted bar, stop, and the slat-adjusting device formed of the arms, shaft, and spring, as set forth.

242. Hot Air Furnaces; John R. Fergusson, Brooklyn, New York.

Claim—The combination and arrangement of the various parts, as described. Also, the evaporation pan in the hot air chamber of the furnace, when made adjustable vertically, as set forth.

243. Device to Prevent Injury from Rupture of the Main Spring of Watches; David Bucklin Fitts, Holliston, Massachusetts.

Claim—The separation of the barrel and the main or other gear wheel of the train, so that the two can revolve independently of each other, and the application thereto of mechanism described, and termed a "reverse motion," as explained.

244. Sediment Collector for Steam Boilers; Hiram H. Havens, City of New York.

Claim—The vessel, a, fitted with a blow-off pipe, in combination with the rings, or their equivalents, presenting alternate horizontal edges and openings from the highest to the lowest water gauge or level, as specified.

245. Sewing Machines; Albert H. Hook, City of New York.

Claim—The combination of the levers, arm, spring, and cam, constructed as set forth.

246. Seeding Machines; R. W. Hunt and M. Kennedy, Galesburg, Illinois.

Claim—Arranging the levers and plates which form the dropping device with the levers in the tubes, as described, whereby the above named parts are rendered capable of being operated simultaneously by the simple action of the bars on the ends of the levers.

247. Shutter Fastener; John McGerrah, Philadelphia, Pennsylvania.

Claim—The application of the brace to the under leaf of an ordinary hinge, and the nut as a continuation of the axis of the segment on which revolves the upper leaf of the hinge, which is secured by the brace and the pin securing the embrace of the brace and nut.

248. Supporting Insulator for Lightning Rods; N. N. McLeod, St. Louis, Missouri.

Claim—So cutting the groove in the edge of the glass as to form the elliptical body shown at A′, fig. 1, whereby the insulator is attached to the building, in the manner described. Also, the combination of the two straps with the glass, and with the pointed conductor, constructed in the manner set forth.

249. Printing Press; David E. James, Utica, New York.

Claim—The arrangement and combination of the leverage through which the operations of the press are performed, including the use of the spring which permits the extension of the lever, q, while the carriage is at rest. Also, in combination with the said arrangement of leverage, the swinging post, and its connexion with the lever, o, as described.

250. Pumps; A. L. Keeports and George Palmer, Littlestown, Pennsylvania.

Claim—The combination of the main pump with the reservoir and ascension pipe, elastic spring valve, the whole arranged in relation to the proportions existing between the valves and pipes, operating as described.

251. Corn Planters; David Ladd, Dearborn, Michigan.

Claim—The peculiar arrangement of the frame, shafts, axle with cavities, wheels, box, ploughs, tubes, scrapers, and rod attached to axle, c, as described.

252. Seeding Machines; Daniel and Austin S. Markham, and David Eldred, Monmouth, Illinois.

Claim—The arrangement of the rotating shaft provided with distributing wheels having buckets attached, the slide bar, the plate, and adjustable strips or bottom, whereby seeds may be planted from the same seed box, either in drills, check rows, or broad-cast, as may be desired.

253. Preservation of Flesh for Food; Nathan B. Marsh, Cincinnati, Ohio.

Claim—1st, Preparing carcasses for injection, and injecting the same, in the manner set forth. 2d, The injecting or transmitting of the saline solutions at a temperature below or above the freezing point, or thereabout, as set forth, so that the flesh may be cooled from within outward. 3d, Injection of portions of the carcasses, as well as the whole beast, with the solutions indicated, in the manner set forth.

254. Screw-neck Bottles; John L. Mason, City of New York.

Claim—A screw-neck or nozzle of a jar or bottle, in combination with a groove separating the thread from

the shoulder of the bottle or jar. Also, a screw on the exterior of the neck of a bottle or jar, in which the neck extends above the screw-thread, and the thread vanishes into the neck of the bottle or jar, as described.

255. GAUGE COCK; Richard L. Mills, Lancaster, Ohio.

Claim—The arrangement and combination of the lining tube and cap, containing the adjustable seats, with the double valve stem, as described.

256. APPARATUS FOR HOLDING SHEEP; S. Minnick, Hopewell, Ohio.

Claim—The adjustable couches, in combination with the neck piece and extension levers, arranged in the manner set forth.

257. VALVE GEAR FOR STEAM ENGINES; Edward Moran, City of New York.

Claim—Operating the valves by means of a valve guide, the movements of which are regulated by projecting cams. Also, the reversing apparatus, as set forth. Also, presenting and withdrawing the cams that give motion to the guide, so as to bring the cams into motion at the proper time to produce the desired valve motion, as specified.

258. VALVES OF STEAM ENGINES; Alden R. Morrill, Northfield, Vermont.

Claim—The arrangement of the valve case, its induction and eduction ports, with respect to the steam chest and the double-headed piston, made in manner to operate within such valve case, as described. Also, when the valve case is made tubular and open at both ends, making it separate from the steam chest, and so as to rest on the bottom of the latter, and confining it therein by means of screw-bolts extending through the top plate of the steam chest, and made to rest on the said valve case. Also, the arrangement of the safety valves and their conducting passages with reference to the double-headed or slide valve, in which arrangement the steam, in passing to the safety valves in order to raise them, does not pass through the double-headed piston or slide valve, but through passages arranged on the opposite sides thereof, as described.

259. MACHINE FOR CUTTING CURVILINEAR SURFACES ON ANGULAR PIECES OF WOOD; George Muller, Sacramento, California.

Claim—A convex plane bit, with edges beveling inward toward the centre, for cutting smooth chamfers of any shape on the edges of railing for express wagons, or on other pieces of wood, and the stand or rest connected therewith in the same machine by means of jaws movable in the frame; the rest or stand may be secured in any desired angle toward the plane to obtain a chamfer of any desired depth and bevel, and also of different shapes.

260. UNDER-DRAIN PLOUGHS; James and Edward Nevison, Morgan, Ohio.

Claim—The adjustable weighted roller, in combination with the plough and drags, as set forth.

261. AUGER FOR WOOD; Martin Norris, Broad Brook, Connecticut.

Claim—The attachment applicable to the common auger, bit, or other boring tool in use, and adjustable in the manner and in connexion with said auger or other boring tool, as specified.

262. SECURING THE ENDS OF RAILWAY BARS; John F. Peabody, Salem, Massachusetts.

Claim—The mode of constructing the chair and rails, the same consisting in making the said chair with the two reverse dovetailed recesses, and the rails with dovetails to enter such recesses. Also, constructing the dovetailed recessed flanch cap, with a projection extending below it, in connexion with making the base plate of the chair, with a recess to receive such projection.

263. LADIES' HOOP SKIRT; S. Peberdy, Philadelphia, Pennsylvania.

Claim—The combination of a spiral stay with the fabric which constitutes a lady's skirt, when said stay is formed by winding a flexible strip or rod made of one piece, or of a series of pieces spliced or united together continuously round the skirt from the bottom to the top of the body of the same.

264. VALVE GEAR OF LOCOMOTIVE ENGINES; Charles J. C. Peterson, Davenport, Iowa.

Claim—1st, Connecting the eccentric ring, from which the slide valve is operated, to the spring which rests on the journal box of the axle, on which the eccentric plate or cam fitting into said ring is fastened, so that the up-and-down motion of the axle has no influence on the motion of the slide valve. 2d, In combination with the eccentric ring attached to the spring, the arrangement of the cam in connexion with rods, and the rocking piece, whereby the slide valve is thrown wide open before the piston has accomplished one-quarter of its stroke, and which rods and rocking piece are so constructed that the motion of the slide valve may be reversed by raising the hook from one step of the rocking piece to the other one.

265. PASTING APPARATUS FOR BAG MACHINES, &c.; S. E. Pettee, Mansfield, Massachusetts.

Claim—Controlling the flow or draft of the paste when carried from a reservoir by a wheel or roll placed in a passage through the bottom of said reservoir, the roll receiving its motion from the passage of the paper under it, when said controlling is effected by means of the piece, D, and screw, E, in the manner described.

266. STEAM ENGINES; Rufus Porter, Washington City, D. C.

Claim—Furnishing steam engine cylinders with balance valves combined with lifting shafts, and so arranged that both induction and eduction valves communicate with the same port. Also, in combination with balance valves, arranged as described, so connecting the induction valves to a governor, by an arrangement of mechanism, that the said induction valve shall be so regulated by the governor as to admit into the cylinder such quantities of steam as shall be required to maintain a proper and uniform motion of the engine.

267. PUMPS; O. W. Preston, Jr., Corning, New York.

Claim—The employment of the elastic band, or its equivalents, serving to close the valves, and also as a means to keep said valves in place. Also, the construction of the piston with the concave cleft plate, in combination with the packing disks or rings, and double adjusting piston rod.

268. BRACE POST FOR FIELD FENCES; Cornelius Quackenbush, Huron, New York.

Claim—The arrangement of the supporting braces and connecting brace, pivoted together and combined with the fence sections in such a manner that the weight of the fence continually acts in firmly supporting and clamping together the sections.

269. HARVESTERS; Wm. and Thomas Schnebley, Hackensack, New Jersey.

Claim—1st, The arrangement and combination of the pendulous lever and slide with the scolloped wheel, as described. 2d, Securing the frame to which the finger-bar is attached to the main frame, by means of the universal joint and the bar fitted in the guide on the main frame, or an equivalent arrangement, so that the sickle may rise and fall bodily to conform to the inequalities of the surface of the ground, and at the same time be rendered capable of being placed directly over the main frame to facilitate the transportation of the machine.

270. STOP GATE FOR CANALS, &c.; J. W. Sprague, Rochester, New York.

Claim—1st, The use of the revolving frames, and their combination with the cross timbers and with the planks. 2d, The use of the revolving lever in connexion with the check chain, as described.

271. CRIMPING BOOT SOLES; Bradford and Lorenzo Stevens, Stoughton, Massachusetts.

Claim—The crimper made of the bifurcated and grooved block, or its equivalent, and the holders applied thereto, as specified.

272. CORN SHELLING MACHINES; G. W. Tolhurst, Liverpool, Ohio.

Claim—The combination of the spur-wheels with the levers or jaws, these several parts being constructed in the manner specified.

273. STRAW CUTTERS; Peter Van de Sande, Assignor to self and Martin Vanderwerf, Rochester, New York.

Claim—Operating the feed rollers by means of the worm on the shaft of the cutter wheel, when combined with the adjustable feed gate, pressure plate, and weighted lever, for regulating the pressure of the feed, and preventing the choking of the rollers, and keeping the straw uniformly compressed at the point of cutting during the progress of the knife, as set forth.

274. SEEDING MACHINES; John W. Vandiver, Shelbyville, Missouri.

Claim—The bars or rods pivoted within the said conveying tubes and having elastic plates attached, the upper ends of said bars or rods being connected with the vibrating plates of the seed distributing device, as set forth.

275. PROPELLER; Washington Van Dusen, Philadelphia, Pennsylvania.

Claim—The arrangement and combination of the frame, block, paddles, cranks, rods, and slots, substantially as described.

276. APPARATUS FOR HOISTING AND STORING ICE; H. Van Steenburgh and Joel Egnor, Catskill, New York.

Claim—The method of transporting ice upon inclined planes by carrying the ice up between parallel endless chains, having bars extended between said chains to hold the ice and propel the same—the planes being pierced with openings, for the passage of the ice to the successive stories of the ice-houses, and the propelling bars being so arranged that the descending bars shall not interfere with the free passage of the ice through the openings in the plane. Also, the use of the hatches described, to close the openings in the plane, in order to permit the ice to pass beyond a lower to an upper story of the ice-house, substantially as described.

277. MACHINE FOR PLATING NAIL HEADS; Wm. H. Van Gieson, Newark, New Jersey.

Claim—1st, Combining the stop pawl, f′, of the intermittently die table, J, with the dog, C, which give motion to the said table, by means of a link, f 3, applied to produce the operation of the dog, in combination with the pawl and the two series of ratchet teeth on the said table, to lock the table. 2d, The pair of receiving jaws with their cavity, to receive and retain the nail while they are closed, applied and operating in combination with the nail feeder and the intermittently rotating die table. 3d, The combination of a shaking apparatus for bringing the shells rim-upward, and a curved conductor for overturning them in their passage through it, to permit and ensure the deposit of the shells crown-upward in the dies. 4th, The combination of the pincers and the plunger in relation with the conductor, to take the shells therefrom and deposit them in the dies. 5th, The combination of the discharging plunger and the stationary hood, having a descending spout, with the intermittently rotating die table. 6th, The stop motion consisting of a feeding rod suspended from a spring-catch attached to the bar, which throws the machine in and out of gear, and operated by means of a cam on the main shaft acting on a spring connected with said rod, in combination with a stationary stop, or its equivalent. 7th, The arrangement of the nail-feeding apparatus, the shell-feeding apparatus, the shell-closing punch, the discharging apparatus, and the stop motion relatively to the intermittently rotating table, substantially as described.

278. MANUFACTURE OF HARD RUBBER; T J. Mayall, Roxbury, Assignor to self and G. N. Davis, Boston, Mass.

Claim—The use of olive oil when incorporated with other materials in the manufacture of hard vulcanized rubber, as described.

279. AIR ENGINES; H. M. Paine, Worcester, Massachusetts.

Claim—The simultaneous moistening and refrigerating of the air previous to its entrance into the pump, in combination with the modifying valve, substantially in the manner described.

280. HINGE FOR WINDOW BLINDS; Thomas E. Williams, Washington City, D C.

Claim—The catch bar and catch, in combination with the cavities and hinge, substantially in the manner described.

281. CULTIVATORS; Wm. Wilmot, Wilmington, Delaware.

Claim—The arrangement and combination of the bars, G G 1, G 2, bars, H, adjustable weights, chains, bars, L, and handles, as described.

282. MACHINES FOR DISTRIBUTING GUANO AND OTHER FERTILIZERS; Elijah Wagner, Westminster, Maryland.

Claim—The combination of the stirrer and the feeder, operated in different directions and at different speed, the two being arranged in the manner specified.

283. RAILROAD CAR BRAKES; Asa D. Whipple, Elmira, New York.

Claim—I do not claim the manner of securing the armature to the shaft, by means of a loose collar and bar—bnt I do claim them in combination with the spring for a new purpose, viz: a mode of varying the intensity of the connexion of the armature with the shaft, and allowing that connexion to give way when the resisting force is sufficient to prevent the car wheels revolving and causing them to slide. Also, the method of communicating the motion of the car wheels to their brakes through the medium of electro-magnetism, consisting substantially of the spring jaws, and of the insulated rings on the axis of the magnet, arranged and operating in combination with the said magnet and adjustable armature, in the manner specified.

284. HAY AND COTTON PRESS; Henry Barnes, Blairsville, Assigner to self and N. G. Macrum, Pittsburgh, Pennsylvania.

Claim—The arrangement and combination of the geared eccentric, inclined rack, and follower rod, substantially as described.

285. RESTORING WASTE VULCANIZED RUBBER; H. L. Hall, Beverly, Massachusetts, Assignor to the Beverly Rubber Company.

Claim—The method of restoring waste vulcanized rubber, by grinding it to a fine or powdered state, or

otherwise, then submitting the same in a close or proper vessel to the action of steam direct upon the rubber or in connexion with water for the space of forty-eight hours, more or less.

286. Sewing Machines; Charles Raymond, Brattleborough, Vermont, Assignor to Willford H. Nettleton, Bristol, Connecticut.

Claim—The arrangement of the adjustable rack having a reciprocating and vibrating motion, and operating in combination with the pinion and feeding wheel to regulate the feed, in the manner described. Also, the slide, u, carrying the looper, and provided with the slot, receiving the pin on the bar that is formed with the carrier for the second thread, whereby the thread carrier is actuated by the reciprocations of the looper, in the manner specified.

287. Weavers' Shuttles; N. J. Willis, Lawrence, Mass., Assignor to S. Chase, Brooklyn, New York, and G. A. Fuller, Lawrence, Massachusetts.

Claim—The manufacture of weavers shuttles, made of separate nose blocks and a hard rubber or indurated vulcanized caoutchouc shell or body, or equivalent, cast or moulded on the nose blocks, in the manner described.

288. Machines for Cutting Dovetail Mouldings; Solander Withington, St. Louis, Missouri.

Claim—The combination of the saws, I′ I and J′ J, with each other and with the two saws, K′ K, in the manner described, the two saws, J′ J, being set in a diagonal plane. Also, adapting and arranging the carriage, C, with the described combination of saws, for the purpose specified. Further, the arranging of three saws, K′, I′, and J′, in the carriage, B, by which the machine is adapted to cut the different lengths of stile.

Disclaimer.

1. Vessels for Holding Liquids; James H. Stimpson, executor of James Stimpson; patented October 17, 1853; disclaimer dated November 16, 1858.

I disclaim so much of the first claim of said patent as may include the application of the double wall to other structures or vessels than ice pitchers.

Additional Improvements.

1. Method of Attaching Lamps to Lanterns; John Fleming, Pittsburgh, Pennsylvania; patented July 6, 1858; additional dated November 2, 1858.

Claim—The improved arrangement described, the same consisting in the attachment of the spring and clips to the lamp case, instead of to the lantern.

2. Propeller; Henry Link, Little Falls, New York; additional dated November 16, 1858.

Claim—The wings made up of a series of horizontal hinged valves graduated in width, as described, in combination with the cylindrical section, either hollow or solid.

3. Cotton Gin Feeders; Jedediah Prescott, Memphis, Tennessee, late of Rockford, Illinois; patented Oct. 13, 1857; additional dated November 30, 1858.

Claim—The endless apron, revolving adjustable toothed bar, rotary bush and toothed cylinder, and grating, combined as set forth.

Re-Issues.

1. Mode of Generating Heat; T. R. Hartell, Assignee of Wm. Hartell and Joseph Lancaster, Philadelphia, Pennsylvania; patented Nov. 23, 1852; re-issued Nov. 2, 1858.

Claim—The adaptation of, or rendering available, tar, as a fuel for the production of the intense and steady heat required for the melting of glass, and for other processes and manufactures, by introducing water or the vapor of water into a furnace or fire-place, in contact, combination with, or in close proximity to the tar, substantially as set forth.

2. Sewing Machines; I. M. Singer and E. Clark, Assignees of John Batchelder, City of New York; patented May 8, 1849; re-issued November 2, 1858.

Claim—The combination of mechanism, so that the cloth or fabric to be sewed being placed upon the machine will be automatically fastened on to the feeding apparatus, carried forward to receive the stitches, and discharged from the feeding apparatus, and so that seams of any desired length may conveniently be sewed.

3. Corn Harvesters; E. C. Manck and W. T. McGahey, Conrad's Store, Virginia; patented April 22, 1856; re-issued November 2, 1858.

Claim—1st, The rotary arms, p, in combination with eccentric guides, q, substantially in the manner specified. 2d, The employment of a double series of cutters, for cutting stalk and stump.

4. Furnace for Burning Bagasse; Elizabeth Ann Harris (late Stillman), City of New York, Administratrix of Alfred Stillman, deceased; patented May 1, 1855; re-issued November 9, 1858.

Claim—1st, The employment, in connexion with the boilers or other vessels of a sugar plantation which require heat, and with the mill for expressing the juice from the cane, of a furnace, constructed substantially in the manner set forth, capable of burning wet bagasse without the aid of other fuel than the bagasse itself, and capable also of utilizing thereby said bagasse as a generator of heat for said vessels. 2d, Combining the cane mill with a furnace, constructed as described, by means of the endless carrier.

5. Treatment of Caoutchouc; A. G. Day, Seymour, Connecticut; re-issued November 9, 1858.

Claim—Running the heat for vulcanizing flexible and elastic hard gum compounds, through the range of temperature, and the comparatively great length of time—that is to say, commencing the heat at about 275°, and carrying the same to 300°, and upwards. Also, making the flexible and elastic hard gum composition of two parts, by weight, of rubber or other vulcanizable gum, and one part of sulphur, when such composition is preparatory to the running of the heat, as described. Also, equalizing the temperature in the heating apparatus by mechanical means.

6. Automatic Steam Whistles in Locomotives; James Harrison, Jr., City of New York, formerly of Milwaukie, Wisconsin; patented April 1, 1856; re-issued November 9, 1858.

Claim—1st, Giving audible indications of the approach of the train of cars to persons at the stations or other points on the route, by an arrangement of means interposed between the truck wheels and whistle, and which are actuated by the truck wheels. 2d, Combining with the means of giving audible indications, other means for giving visible indications to persons charged with the care of the train, both sets of means being

actuated by the truck wheels. 3d, Varying and modifying the tones or sounds of the whistle by the form and surface of the lifters and their arrangement and position upon the cylinder.

7. STOVES; Joseph C. Henderson, Albany, New York; patented May 18, 1858; re-issued November 9, 1858.

Claim—The new radiating combustion chamber with a conducted orifice or throat producing a plenum in said chamber, in combination with a fire-box or pot, and with an exterior chamber surrounding said combustion chamber, and from which exterior chamber the heat is taken by radiation or conductor, substantially as set forth.

8. SEED PLANTERS; Jarvis Case, Bloomington, Illinois; patented January 16, 1855; re-issued November 16, 1858.

Claim—In combination with a corn planting machine that is constantly moved over the ground, and drops the grain intermittently, the so combining of two slides, one of which is at or near the seed hopper, and the other at or near the ground, or their equivalents, with a lever, as that the operator or attendant on the machine can open said slides at the proper time to deposit the seed, and prepare a new charge by the double dropping, as specified.

9. PRINTING PRESS; George P. Gordon, City of New York; patented June 13, 1854; re-issued November 16, 1858.

Claim—Relieving the sheet from the type, and taking the sheet directly from the platen, or either of them, with or by the same nippers, which shall carry such sheet to its place of deposit or piling. Also, giving, with one inking cylinder, two distributions to the inking rollers for each impression, viz: one distribution prior to passing the form, and one distribution prior to the return of the form to its first position. Also, the arrangement of the spring, connecting rod, crank, and stops, as described, to operate the bed and give the necessary dwell for the impression.

10. GRINDING MILLS; Edward Harrison, New Haven, Connecticut; patented June 6, 1854; re-issued November 16, 1858.

Claim—The method of securing the runner stone on the driving spindle in a grinding mill, by means of a metallic band, or its equivalent, embracing the periphery of the stone, by combining said band with a hub, and a back plate of at least as great diameter as the runner, and rigidly attached to the spindle, such combination operating to secure the stone firmly in its place.

11. WOOD SCREWS; The Eagle Screw Co., Assignees of Thomas J. Sloan, Providence, Rhode Island; patented August 20, 1846; re-issued November 23, 1858.

Claim—1st, Making the core with a conical point, in combination with the body of a cylindrical form, or nearly so. 2d, Making the core with a conical point, in combination with the thread formed on such conical point of a gradually less depth as it approaches the apex of the core, and with the several convolutions on the body, at equal distances apart. 3d. Making wood screws with the core or a conical shape along that part of the length of the screw extending from where the thread begins on the shank, to where it becomes of full depth. 4th, Making wood screws with the core of a cylindrical, or nearly cylindrical, form, and with a conical point, in combination with the thread of equal pitch along the conical point and body, that is, with all the convolutions at equal distances apart, and of gradually less depth from the base to the apex of the core.

12. REDUCING THE FRICTION OF JOURNALS OF AXLES ON RAILWAYS; J. K. Denning, City of New York, Assignee of Leon Joseph Pomine De Mirimondi, Paris, France; patented August 23, 1856; re-issued November 23, 1858.

Claim—The arrangement for the semi-boxes for resting on the journals of the friction rollers within the upper part of the main part of the main journal box, and entirely enclosed within the said main box, in combination with the axle journal on which the rollers rest to sustain the load. Also, taking the lubricating matter from the looser part of the main box, and applying it to the journals of the rollers by the projections at the ends of the axle journals. Also, the method of lubricating the journals of the rollers, and the periphery of the axle journal and the rollers, by the projections on the axle, which in rotating take the lubricating matter from the reservoir in the main box, and apply it to the journals of the rollers above, that the drippings therefrom may lubricate the periphery of the rollers and axle journal, substantially as described.

13. WATCH CASES; Elihu Bliss, Newark, New Jersey; patented April 13, 1856; re-issued Nov. 23, 1858.

Claim—Arranging the push piece which passes through the pendent, in combination with the pin, and so as to operate the spring catch to the closed bizzle of the outer case, when the face of the watch is in either position, as set forth. Also, arranging the case of the watch which contains the movement, and which carries the dial within a surrounding ring or rim, so that it can be turned within the said ring and in the plane thereof. Also, arranging the journals by which the body of the watch is attached to an outer case, and on which it turns reversed, so as to leave the works of the watch free to be shifted in its surrounding ring, substantially as described.

14. SAW MILLS; Hazard Knowles, City of New York; patented Sept. 28, 1852; re-issued Nov. 30, 1858.

Claim—So guiding the movements of the saw as to cause it to advance in the line of its plane as it descends, for the purpose of properly distributing amongst the teeth of said saw, the cutting action which may be exerted thereby upon the material operated upon. Also, arranging the ways of the saw gate in such a manner with relation to the feeding apparatus, that the amount of feeding movement imparted to the carriage will always be in perfect harmony with the amount of cutting action exerted by the saw. Also, arranging the compound parts of my improved saw mill, in such a manner that the amount of cutting action exerted by the saw can be speedily varied whilst it is in motion, from its maximum performance down to nothing, and vice-versa.

15. CHURN; James Macnish, Berlin, Wisconsin; patented April 20, 1858; re-issued Nov. 30, 1858.

Claim—Expressing the butter from the globules or sacks of milk or cream by friction, such as rubbing, washing, or grinding, when accomplished in any manner equivalent to that specified.

16. FELTING FOR COATS, HATS, &c.; M. Osborne, City of New York; re-issued November 30, 1858.

Claim—The method of manufacturing articles of wearing apparel, of which wool or other similar animal fibre constitutes a larger part, as set forth.

DESIGNS.

1. STOVES; E. J. Cridge, Troy, New York; dated November 2, 1858.

2. STATUES OF HENRY CLAY; T. Ball, Boston, Massachusetts, Assignor to G. W. Nichols, City of New York; dated November 9, 1858.

3. STOVES; L. D. Thomas, North Dighton, Massachusetts, Assignor to the Dighton Furnace Company; dated November 9, 1858.

4. HAT AND CANE STAND; Edward Reynolds, Assignor to Thomas W. Brown, Boston, Massachusetts; dated November 16, 1858.

5. COOKS' STOVE; A. C. Barstow, Providence, Rhode Island; dated November 16, 1858.

6. SCRIPT TYPE; James Conner, City of New York; dated November 16, 1858.

7. STOVE PLATES; Samuel D. Vose, Albany, New York; dated November 23, 1858.

8. IRON FENCES; Edwin Gomez, City of New York; dated November 30, 1858.

DECEMBER 7.

1. COOKING STOVES; Federal C. Adams and Joseph Peckover, Cincinnati, Ohio.

Claim—In combination with the smoke passages formed by the single vertical and inclined partition, arranged with regard to the exit aperture, as described, the admitting of air under the grate into the air spaces, and from thence into the smoke passages, by means of the perforations in the lip or flanch of the back lining plates of fire-box.

2. EXTENSION TABLE; Adolphus Bader, City of New York.

Claim—The arrangement of additional plates in arms of such a shape and form that by drawing out the arms the plates are brought to a level with the top of the table. Also, confining these arms at the proper places by means of the notches and the hook, and to guide the same by means of pins and notches.

3. SEWING MACHINES; Robert M. Berry, City of New York.

Claim—The combination and arrangement of the feeding foot of cork, or its equivalent, with the peculiar feeding mechanism described, or its equivalent.

4. SEWING MACHINES; Hobert H. Bishop, Bristol, Connecticut.

Claim—The plate in slides on the needle bar at right angles to it, and carrying the eye-pointed needle, in combination with the bent lever and stops, or their equivalents.

5. WASHING MACHINE; Jesse Bowen, Yellow Bud, Ohio.

Claim—The alternating rotation of the tub in one direction, and the similar rotation of the rubber in an opposite direction, by means of the levers, racks, and pinions, arranged as set forth.

6. SEED PLANTERS; Jarvis Case, Bloomington, Illinois.

Claim—1st, Dispensing with side rails and connecting the front and rear truck by the driver's seat, hinged to the front truck, and rigidly secured to the rear one. 2d, The so arranging of a reversible marker upon the front truck of the machine, so that when planting the runner shall not touch the marker arm; but when said front truck is raised up to turn the machine around, the runner shall catch and raise up and hold up said marker. 3d, In the construction of the runner, the hollowing out for the marker arm, the forming of the seed ducts in the sides of the runners, and so inclining the straight edge thereof as that its heel shall be the lowest point.

7. RAILROAD CAR BRAKES; Henry E. Chapman, Albany, New York.

Claim—The arrangement of the shaft, L, having upon it the right and left-hand screw threads, the right and left-hand nuts, the rods, the levers, I I′, the shafts, H H′, the levers, G G′, and the cross-bar, in their relation to each other and to the brake, as set forth.

8. BURNERS FOR LAMPS; M. B. Dyott, Philadelphia, Pennsylvania.

Claim—Regulating the light of a gas lamp by raising and lowering the heater and pin connected to it, while the head of the burner remains stationary. Also, in combination with the heater and burner, the valve or projection on the one, and the valve seat on the other, when the said valve and seat are located between the top of the wick and the openings at which the gas is burned.

9. MACHINE FOR CUTTING STAVES FROM THE BOLT; Isaac W. Forbes, Jefferson, Wisconsin.

Claim—The arrangement of the hinged platform and its latch bolt in such a manner with relation to the concaves and the knife of the cutter head, that the said parts can be operated substantially in the manner set forth.

10. HORSE RAKES; Christian Garver, Londonderry Township, Pennsylvania.

Claim—The arrangement of the cross-piece, staples, parallel arms, slots, and pins, with rake, in the manner specified.

11. CORN HARVESTERS; Bronson Murray, Ottawa, and John Van Doren, Farm Ridge, Illinois.

Claim—In combination with the inclined knife or cutter, the curved guides or arms, for bending over and thus facilitating the cutting. Also, in combination with the stationary cutter, the reciprocating cutter, when operating together in the manner set forth. Also, in combination with the cutting and guiding or directing apparatus for severing and dropping the stalks, the shovers for moving them rearward. Also, the arranging of the conveying apron upon removable supports, and so inclining it that it will convey the stalks over or past the opening, J, behind it, when used, but leave a delivery at J when removed.

12. COMPOSITION FOR PURIFYING GAS; Paul B. Goddard, Philadelphia, Pennsylvania.

Claim—The use of lime dissolved in a saccharine solution, whether combined or not with other substances.

13. HORSE RAKES; John W. Hadcock and Parker Wilcox, Norway, New York.

Claim—The arrangement of the rake teeth with the metal point or shield, as described.

14. WASHING MACHINE; John G. Haley, Isaac Wilson, and Jackson Lyon, Cameron, Illinois.

Claim—Making the spaces between the edges of the slats of the washboard of a width different from that of the spaces between the edges of the slats of the cylinder, and allowing the slats of each to interlock or mash and slip upon each other, for the purpose of causing the clothes to move or change their position in the wash-box whilst they are undergoing the rubbing process.

15. HARVESTERS; Henry Opp, Belleville, Illinois.

Claim—The employment of the plate, operated as described, in combination with the bar, J, or its equivalent, attached to the finger-bar, G.

16. Wrought Nail Machine; Adrian V. B. Orr and Gideon Bantz, Frederick, Maryland.

Claim—1st, The dies, constructed in the manner described, and when acting simultaneously, in combination with the heading swage upon the heated bar, as specified. 2d, With the said header and dies, the use of the elongated tweer, opening in the manner set forth.

17. Lime-kilns; Clark D. Page, Rochester, New York.

Claim—The construction of the cupola with the sectional form shown in fig. 2, combined with the arrangement of the flues, as described.

18. Sewing Machines; Samuel F. Pratt, Roxbury, Massachusetts.

Claim—For interlooping two threads in order to sew cloth or other material, by means of an eye-pointed needle, or its equivalent, the combination of a thread carrier or adjuster and a hook, so acting together and with the eye-pointed needle, or its equivalent, as not only to cause the thread of the carrier to be laid or presented in rear of the needle in a proper manner to be seized by the hook, but to cause the hook to pass through the loop of the needle, seize the thread of the carrier, and next recede and draw the said thread in the form of a loop through the loop of the needle, and properly present it for the needle to pass through it during its next downward movement, after the cloth may have been fed along the length of the stitch. Also, the thread carrier constructed with the slit, or its equivalent, and barb, operating in the manner described, to present the lower thread to the reciprocating looper hook, which will draw it through the loop formed in the needle thread.

19. Method of Measuring and Recording by the Tape; E. A. Preston, Battle Creek, Michigan.

Claim—The described arrangement of a tape measure, whereby the same is made self-registering by means of the drum, the pawl, and the ratchet wheel, in combination with the spring arranged in the barrel, and with the pinions and the wheels.

20. Platform Scales; Elnathan Sampson, St. Johnsbury, Vermont.

Claim—The arrangement of the stationary frame, descending and sliding platform, rising frame, descending arm, and weighing beam, when the whole is combined by means of links and knife edge bearings, and arranged as described.

21. Amalgamator; Lewis Solomon, City of New York.

Claim—1st, The use of elongated amalgamating chambers, when arranged to operate in the manner specified. 2d, The arrangement of the amalgamating chambers within a heated chamber, for the purposes specified.

22. Water-proof Cork Composition; Andrew Stevens, City of New York.

Claim—Granulated cork that is covered and impregnated with the composition specified.

[By impregnating and coating granulated cork with a solution of a gum in alcohol and certain essential oils, it is rendered less susceptible of absorbing moisture, and better adapted to the purposes of filling the quilted linings of overcoats, jackets, mattresses, and other articles of a like character, intended for life-preservers; and also imparts to them a peculiar and pleasant odor, which is, however, so distasteful and injurious to bedbugs and other vermin, as to keep them entirely away from the articles so impregnated.]

23. Guard for Circular Saws; Reuben S. James, Bethel, Vermont.

Claim—The shield with blade arranged with or without tongue, for circular saws, operating substantially as described.

24. Burners for Lamps; Josee Johnson and Frederick Bailey, City of New York.

Claim—The combination in a lamp of the tubes, glass tubes, and barrel, in the manner set forth.

25. Grain and Grass Harvesters; M. G. Hubbard, Penn Yan, New York.

Claim—The attachment of the front corner of the reaping platform to the corner of the machine, by means of the hinge, constructed as set forth. Also, the elastic connexion between the reel and driving power, in combination with the flexible attachment of the outer reel arm. Also, the employment of the self-sustaining raising lever, when constructed as specified. Also, supporting a portion of the weight of the outer end of the platform by means of the spring, or its equivalent.

26. Sealing Preserve Cans; Allen Taylor, Baltimore, Maryland.

Claim—The forming of the gutter-shaped rim which supports the sealing cement of a porous or textile substance, said substance being applied to the downwardly bent edge of the cover, and forming with said edge a V-shaped gutter, in which the cement when melted will be confined, yet allowed to come in contact with the metal surface, and thus seal the cover to the can with a small expenditure of cement, and in such a manner that the cover can be readily unsealed without cutting up and wasting the cement, as when other modes of sealing are adopted.

27. Edge Keys for Boots; George C. Todd, Lynn, Massachusetts.

Claim—The shank, in combination with the disk so attached to the side of it that the angle of inclination of the disk to the shank may be varied as required.

28. Preventing Incrustation of Steam Boilers; John Warren Harnett, Cincinnati, Ohio.

Claim—The means and manner specified of injecting oil, or other fatty matter, in a liquid state, into the boiler, for the purposes set forth, whereby the said oil or other fatty matter is fed to the boiler simultaneously and in connexion with the water, as described.

29. Stoves; Charles Hartwell, Boston, Massachusetts.

Claim—In connexion with the evaporating vessel, or its equivalent, for supplying vapor to the air, the described arrangement of the parts of my stove, consisting of the fire pot, lower chamber, receiving pipe, tubes, and oven, or other cooking vessel, arranged in the manner described. And in connexion with the above, the aperture leading from the interior of the case to the ash pit.

30. Watch Cases; Auguste Lachat, City of New York.

Claim—The method of constructing a "magic" watch case, substantially as described. Also, making the head of the push pin movable, in the manner set forth.

31. Sewing Machines; John Mackenzie, Cleveland, Ohio.

Claim—Combining the lever-like feed dog with the revolving eccentric pin, which operates the shuttle by means of the vibrating, slotted, double cam-like plate, and the two levers, the connecting rod and the springs, arranged as described, to produce the movements of the feed dog.

32. SAW SET; Edward Marshall, City of New York.

Claim—The described method of setting saws, whereby the saw is firmly clamped and held in the slot by means of claws, while the tooth is being bent or set, the saw being alternately clamped and released as the teeth are successively set.

33. FURNACE FOR MELTING IRON; Wm. McFarland, St. Louis, Missouri.

Claim—The combination of a reservoir with a cupola furnace, so as to collect the metal as fast as melted, substantially as set forth.

34. LIFE BERTH FOR VESSELS; James P. McLean, City of New York.

Claim—The arrangement of the removable bed or bottom, canvass joints, lockers, oar and signal compartment, air tubes, and the projections, grooves, and plates, combined in the manner described.

35. DOOR LATCH; Henry Hackman, Jr., Pequa, Pennsylvania.

Claim—The revolving bolt, the lever arms, peg, coiled spring, the shouldered shank, and spring catch, when combined as described.

36. BUSTLES; Charles A. Postley, Jersey City, New Jersey.

Claim—The combination of adjustable hoops and adjustable waist ribs, arranged in the manner described, so that the size of the bustle and the position of the hoops may be varied to suit the wearer.

37. DEVICE FOR SUPPORTING FURNITURE CASTERS; Henry E. Richards, Newark, New Jersey.

Claim—The arrangement of the concavity, A, and the points, B B B, substantially as described.

38. SAW SETS; I. P. Vanvleck, Cooksville, Wisconsin.

Claim—The hammer head operated from the treadle through the medium of the bar, springs, and arm, in connexion with the anvil and gauge, arranged substantially as set forth.

39. MODE OF OPENING AND CLOSING FARM GATES BY APPROACHING VEHICLES; Caleb Winegar, Union Springs, New York.

Claim—1st, The combination only of two or more capstan rollers. 2d, The operating of gates by means of winding up the weight, or equivalent spring, with the wheel of a carriage, or by lever, each time in passing and re-passing the gate, sufficient to open or close the gate or gates.

40. SPINDLE FOR THROSTLE SPINNING; C. E. Brown, Assignor to self, John Tenney, and John Rhodes, Millbury, Massachusetts.

Claim—The combination and arrangement of the stationary socket spindle, the loose spindle, and the reversed flyer and whir, when constructed in the manner described.

41. BILLIARD TABLE CUSHION; J. E. Came, Assignor to self and James E. Came, Boston, Massachusetts.

Claim—My improved mode of making a billiard table cushion, viz: of a vulcanized caoutchouc body, a thin facing of hickory, or its equivalent, and a covering thereto of water-proof cloth, or other material, the whole being applied together and covered with one or more layers of cloth, substantially as described.

42. SEWING MACHINES; John Frost, Assignor to self and James Frost, City of New York.

Claim—The employment of the slotted arm, the rod, and pin, and the swiveling guide, or their respective equivalents, in combination with each other and with the crank, substantially as described, for the purpose of communicating the requisite irregular motion to the needle bar of a sewing machine.

43. VULCANIZED RUBBER GOODS; H. L. Hall, Beverly, Massachusetts, Assignor to the Beverly Rubber Co.

Claim—The improvement in the manufacture of rubber goods of every description, which consists in combining fibrous materials with waste vulcanized rubber rendered soft and plastic in the manner described, whether such fibrous materials be such only as are found in old or waste vulcanized goods or fabrics, or new fibrous materials added to the rubber compound.

44. SECURING THE ARMS TO THE HUBS OF PROPELLERS; H. O. Perry, Assignor to self and Sidney Sheppard, Buffalo, New York.

Claim—The employment of the conical ends confined in the corresponding sockets by the keys, substantially in the manner set forth.

45. VALVES FOR GAS METRES; R. M. Potter, Assignor to Wm. Mackenzie, Assignor to R. M. Potter, City of New York.

Claim—The eccentric sliding valve, when constructed, arranged, and operating substantially as described.

46. SAW MILL; S. R. Smith and P. P. Lane, Assignors to Lane & Bodley, Cincinnati, Ohio.

Claim—1st, The longitudinal rack bar, combined as described, with the segment wheel, pinion, and accessory rack, so as to admit of the head blocks being placed in gear at any required distance asunder, without disconnexion or adjustment of parts. 2d, The described arrangement of the collar, box, cushions, and temper screws, whereby the saw may be fixed rigidly in any position or allowed lateral play to any desired extent, and return automatically to its normal plane when released, and by means of which the position of the said normal plane may be varied at pleasure. 3d, The perforations applied to the transverse racks, in the manner explained.

47. SEWING MACHINES; S. G. Tylor, Assignor to self, G. J. Savage, and J. W. Barnum, Quincy, Illinois.

Claim—Making the bearing surface of a feeding foot or pressure pad of a sewing machine, or their equivalents, with two or more parts or toes, each self-adjusting to varying thicknesses, or inequalities of surface, cording, hemming, or sewing plain work, and combining the same with a sewing machine feeding apparatus, substantially as specified.

48. BURNERS FOR VAPOR LAMPS; E. M. Williams, Assignor to self and John Gabel, Philadelphia, Penna.

Claim—The supplemental sliding wick tube, arranged relatively with one or more vapor tubes, to operate substantially as set forth.

49. PREVENTING EXPLOSIONS IN STEAM BOILERS; Jane H. Lloyd, executrix of R. L. Lloyd, deceased, late of Philadelphia, Assignor to G. P. Perry, of said Philadelphia, Pennsylvania.

Claim—Placing within a steam boiler a metallic conductor, arranged to communicate with the outside of the said boiler, substantially in the manner set forth, in order to maintain an electrical equilibrium between the inside of the boiler and the outside thereof, or with any matter surrounding or in connexion therewith, for the purpose specified.

ABSTRACTS OF SPECIFICATIONS OF RECENT PATENTS.

Two Patents granted, January 11, 1859.

Palmer's Patent Arm and Hand.

FURNISHED FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Fig. 1, represents an arm to be applied above the elbow. The articulation A B, is a ball and socket, connected by the steel plates C C, and turning upon the pinion D. The functions of the bones in the fore-arm (Radius and Ulna,) are imitated by the conical shaft E, which terminates in a ball at the elbow and wrist J J. The wrist is articulated with a ball and socket firmly united by catgut tendons F G H tensely drawn over the convexity of the shaft E at the elbow. It has every motion of the natural wrist. The hand rotates on the fore-arm, being susceptible of pronation and supination, or any angle or degree of flexion and extension desirable. The extensor tendons K L M N O acting with the springs 1, 2, 3, 4, 5, open the hand. The detached ball and socket joints of the thumb and fingers are indicated by the figs. 1, 2, and 1, 2, 3.

The fingers are articulated on steel rods and pinions imitating the bones, as seen in the thumb and the first and third fingers. The exterior is brought to a perfect imitation of the natural arm (as shown in the outline, or in Fig. 5,) by a soft elastic substance, which rotates around the fore-arm, preserving anatomical symmetry in every position. It is covered with a delicate skin.

Fig. 2, is the same arm extended, with the fingers semi-flexed. The belt A attaches the arm to the body. The small belt C C 2, is connected by a tendon to a clasp and pulley D E. The great muscle F is the continuity of the flexor tendons G H I J K. These tendons pass sinuously over pulleys, or fixed sheaves, 1, 2, 3, 4, 5, through the hand, to the end of the fingers and thumb. The principles of the lever and pulley are thus *combined*, and the *maximum power* retained at all angles of flexion or extension. A slight motion of the shoulders, with extension of the fore-arm, produces an incredible grasp, as seen in Fig. 3.

An object of any shape, such as a pen, a fork, or an apple, is held with facility. By a slight motion of the shoulders the belt A B causes the great muscle F and its tendons, to contract *powerfully*, closing the hand. A movement easily and naturally made actuates the tendon CC, and fastens the clasp D upon the muscle, so as to retain the grasp in any position or motion of the arm when in use. This is regarded as invaluable for holding reins in *driving*, or carrying articles with *safety*. An easy counter motion *unfastens the clasp*, relaxing the flexor muscle and its tendons, and the extensors open the hand. This principle performs most perfectly in arm applied below the elbow as in Fig. 3.

Fig. 3. In this are seen the belt A B C, the great muscle F and its tendons, the clasp and pulley D E as in Fig. 2. A fixed eyelet F 2, clasps the great muscle F, and thus guides the flexor tendons of the fingers. The line 1, shows the union of the natural with the artificial arm.

Fig. 4, shows a hand holding a fork. The tendon A A 2, passes through the clasp B and around the pulley C to the side of the clasp D, where it

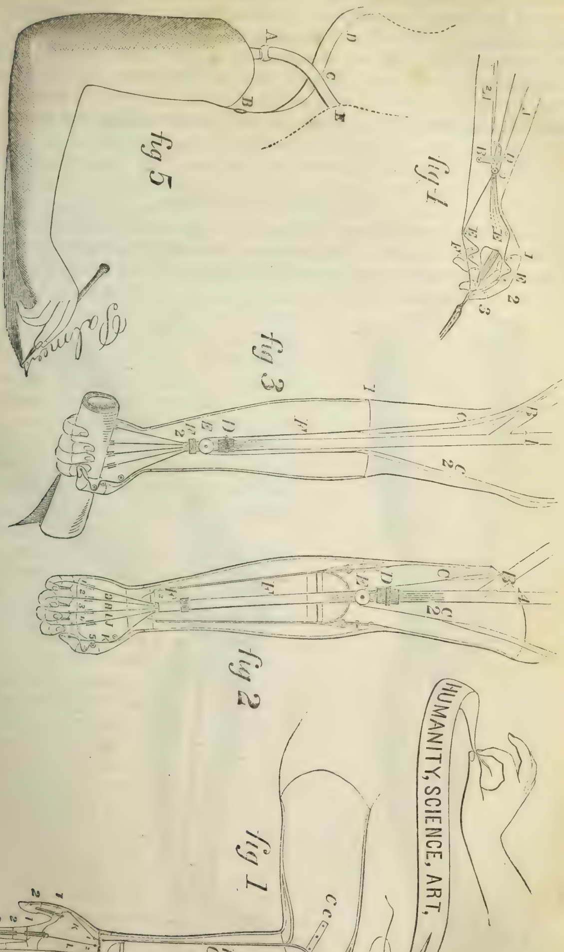


fig 5
Palmer
fig 4
fig 3
fig 2
fig 1
HUMANITY, SCIENCE, ART,

fastens or *unfastens* the clasp by movements before explained. The joints of the fingers and thumb are flexed upon the fork by powerful tension of the great muscle and its tendons. The sinuosity of the tendons passing over the pulleys, or sheaves, E E E, shows the new and useful principle of effectually combining the lever and pulley to gain the *utmost power*, *strength*, *elasticity*, and *adaptability* to the various uses of an Artificial Arm and Hand. They are easily adjusted by the wearer.

Specification of the Leg.

The articulations of knee, ankle, and toes, consist of detached ball and socket joints, A B C. The knee and ankle are articulated by means of the steel bolts, E E, combining with plates of steel firmly riveted to

Fig. 1.

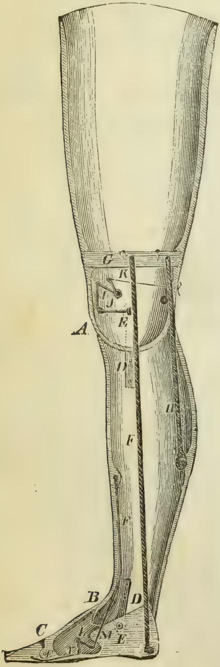
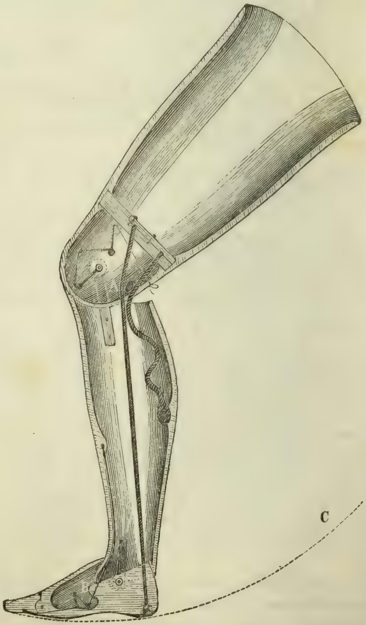


Fig. 2.

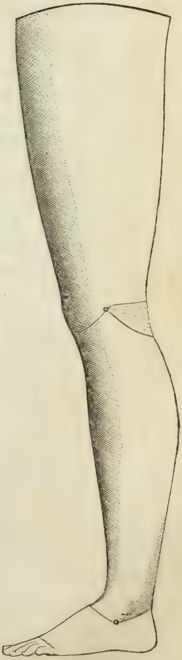


the sides of the leg D D. To these side plates are immovably fastened the steel bolts, E E. The bolts take bearings in solid wood (properly bushed) across the *entire diameter of the knee and ankle*, being four-

fold more reliable and durable than those of the usual construction. All the joints are so constructed that no *two pieces of metal move against each other in the entire limb.* The contact of all broad surfaces is avoided where motion is required, and thus friction is reduced to the *lowest degree possible.* These joints often perform many months without need of oil, or other attention, a desideratum fully appreciated by the wearer.

The tendo achillis, or heel tendon, F, perfectly imitates the natural one. It is attached to the bridge, G, in the thigh, and passing down on the back side of the knee bolt, E, is firmly fastened to the heel. It acts through the knee bolt, *on a centre*, when the weight is on the leg, imparting security and firmness to the knee and ankle joints, thus obviating all necessity for *knee-catches.* When the knee bends in taking a step, this tendon vibrates from the knee bolt to the back side of the thigh, A, Fig. 2. It descends through the leg so as to allow the foot to rise above all obstructions, in flexion, and carries the foot down again, in extension of the leg for the next step, so as to take a firm support on the ball of the foot. Nature-like elasticity is thus attained, and all thumping sounds are avoided.

Fig. 3.



Another tendon, H, of great strength and slight elasticity, arrests the motion of the knee, gently, in walking, thus preventing all disagreeable sound and jarring sensation, and giving requisite elasticity to the knee.

A spring, lever, and tendon, I J K, combining with the knee bolt, give instant extension to the leg when it has been semi-flexed to take a step, and admit of perfect flexion in sitting.

A spring and tendons in the foot, L M N, impart proper and reliable action to the ankle joint and toes. The sole of the foot is made soft to insure *lightness and elasticity of step.*

The stump receives no weight *on the end*, and is well covered and protected to avoid friction and excoriation.

These joints, springs, and tendons are all *patented*, and no modification of any part will enable a person successfully to evade the patents, which contain about *twenty distinct and combined claims*, covering nearly the *entire mechanism.* Fig. 3, is a view of Palmer's perfect model.

PALMER'S PATENT LEG is composed of a great variety of such materials as most effectually combine to give a perfect imitation of the

human limb. This combination of substances, all experience has taught, produces a much lighter, stronger, and comelier artificial limb than can be made chiefly of any one material. Wood, metal, gutta percha, and india rubber have all been tried again and again, and been abandoned by all mechanicians who were competent to construct, and also by all experienced wearers of false limbs, who can duly appreciate the qualities of a perfect substitute.

This invention differs radically from all other false limbs, and is fully protected by various patents. It is so symmetrical and life-like in appearance and motion, as to be often mistaken, when in use, for the natural limb. The internal mechanism is so perfectly combined, and the polished exterior so exquisitely colored and finished, that delicate silk hose and slippers may be worn without betraying the work of art.

The external skin, though delicate in appearance, is very strong. It is indissolubly cemented without perceptible seam, and rendered impervious to water by a beautiful skin-tinted enamel, which is rivaled only by the color of the natural skin.

The mechanism is adapted to all forms of amputation, whether above or below the knee, or through the foot, and is successfully applied to the shortest and tenderest stumps. It is attached to the body in a manner which insures entire comfort.

The distinguishing characteristics of this Patent Leg are its life-like elasticity and flexibility, excessive lightness, durability, adaptability, and perfection of external appearance. These elements have been accorded to it by the first Surgeons of America, England, and France, and by nearly three thousand mutilated persons, who are now in the daily use of this Invention.

Palmer's Patent Arm is an original invention, which has cost years of study and experiments. It has been duly tested by numerous ladies and gentlemen, and pronounced equal to the Patent Leg.

MECHANICS, PHYSICS, AND CHEMISTRY.

Notice of Mr. L. C. Stephens' Patent Combination Rule.

To the Committee on Publications.

Gentlemen :—As all simple and comparatively accurate instruments for the use of engineers and mechanics, whereby they are enabled with facility to make measurements and calculations are of importance, I would call their attention through your *Journal* to a combination rule manufactured by L. C. Stephens & Co., of Pine Meadow, Connecticut. This rule is composed of two arms of 6 inches in length, each folding together by one joint; when folded, it is $1\frac{3}{8}$ inches wide and $\frac{3}{8}$ of an inch thick, and is protected by strong brass binding;—its weight only slightly exceeds the ordinary pocket rule. The combination consists of its having a spirit level let into the upper brass binding of one of the six-inch arms—the glass is let into the rule

and protected by a brass plate put on with screws, and therefore can be removed and replaced in case it should accidentally be broken. There is a steel blade shutting into the other arm, having the axis upon which it moves near the opposite extremity from the joint of the two arms proper. When this blade is opened out from the arm, and is raised so as to form an angle of 90° with said arm, it is prevented from opening further by two stops in the arm, one placed below the axis and the other above. The upper arm, or that containing the level, can then be closed down—the steel blade fitting into a slit at the outer end of the arm. In this end there is an eccentric, which, at pleasure, can be made to press slightly against the blade, and thus hold it rigid. One side of the blade is marked with lines which show the value of the angle formed by the two arms of the rule, the blade being moved until the under edge of the slit arm is coincident with the mark on the blade showing the required angle then the two inner, or two outer edges of the arms will show the containing lines of the angle. The other side of the blade is marked in inches and twelfths. The inner edge of the arm in which the blade closes is also divided into inches and twelfths, so that when the blade is in a position at right angles with this arm it may form a brace scale.

The inner edges of the arm holding the level is also marked, so that it may show the angle formed by the blade and its own arm. The arms on their sides are divided into inches, eighths, and sixteenths, as in ordinary rules, also into tenths of inches, and also into several scales for the convenience of draughtsmen.

The uses of this convenient little instrument are very numerous—when the blade is closed into its arm and the arms are shut together, it is a spirit level. When the blade is opened at an angle of 90° with its arm, and the other arm shut down so that the slit holds the blade rigid, the blade is perpendicular to the edge containing the level, and the instrument can then be used as a plumb. The combination of a level and moving blade, and arm for obtaining angles, will, to any one in possession of the instrument, suggest various methods of obtaining heights, distances, &c. Besides the above uses, for all measurements requiring only the ordinary foot rule, it will, from the sub-divisions on the sides of the arms, answer the purpose. H. J. T.

Mode of Preserving Fresh Fruits.

Dissolve gutta percha in sulphuret of carbon. The liquid separates into three layers, the upper of which contains mucilaginous matters, and the lower earthy compounds and other impurities; the middle layer is perfectly limpid and contains the pure gutta percha. Separate this from the others by a syphon.

Gather the fruits rather before complete ripeness—dry and brush them; dip them in spirits of wine; then two or three times in the gutta percha liquid; they may then be kept in a box or closet, the temperature of which must not exceed 50° Fahr.

When the fruit is to be eaten, the coating may be peeled off or washed off with a little spirits of wine; and, notwithstanding time and journeys, the fruit will be found to have preserved its taste and perfume, as though it were perfectly fresh.—*Cosmos.*

For the Journal of the Franklin Institute.

Particulars of the Steamer White Cloud.

Hull built by Thomas Collyer. Machinery by Morgan Iron Works. Owners, I. M. Forbes & Co.

Hull.—		
Length on deck,		180 feet.
" load line,		179 "
Breadth of beam, (*molded*,)		30 "
Depth of hold,		10 " 7 inches.
" to spar deck,		10 " 7 "
Frames, *molded*,		14 "
" *sided*,		8 "
" apart at centre 26 ins., and strapped with diagonal and double laid braces, $3\frac{1}{2} \times \frac{1}{8}$ ins.		
Draft of water,		5 " 6 "
" at below pressure and revolutions,	24.	
Tonnage,	550.	
Masts—Two—Schooner rigged.		
Engines.—Vertical beam.		
Diameter of cylinder,		44 inches.
Length of stroke,		10 feet.
Maximum pressure of steam,	30 lbs.	
Cut-off,	variable.	
Boilers—Two—Single return flued.		
Length of boilers,		26 feet.
Breadth "		8 " 6 inches.
Height " exclusive of steam chimney,		8 "
Number of furnaces,	4.	
Breadth of furnaces,		3 " 6 "
Length of grate bars,		7 "
Number of flues,	above 4. below 10.	
Internal diameter of flues,	above 17 ins. below 10, 12, and $12\frac{1}{2}$ ins.	
Length of flues,	above 14 ft. 7 ins. below 13 ft. 11 ins.	
Heating surface,		2284 square feet.
Diameter of smoke pipe,		5 feet.
Height "		31 "
Paddle Wheels.—		
Diameter, overboards,		26 "
Length of blades,		7 "
Depth "		3 "
Number "	24.	

Remarks.—One independent steam, fire, and bilge pump, constructed for service on Canton River; water-wheel guards for half width extends fore and aft. Date of trial, January, 1859. C. H. H.

For the Journal of the Franklin Institute.

Particulars of the Steamer Karnak.

Hull built by Denney & Brothers. Machinery by Tullock & Denney, Dumbarton, Scotland. Intended service, New York to Havana.

Hull.—		
Length on deck from fore part of stem to after part of stern post above spar deck,		210 feet.
Breadth of beam at midship section,		30 " 10 inches.
Depth of hold to spar deck,		25 " 6 "
" main deck,		18 " 6 "
Frames Z ∠ at throats, *molded,*		$4\frac{1}{2}$ "
" " *sided,*		$\frac{3}{8}$ "
" distance apart at centres,		14 "
Keel,		6 "
Length of engine and boiler space,		30 "
Draft of water at load line,		18 "
" below pressure and revolutions,		18 "
Area of immersed midship section at this draft,		495 sq. feet.
Tonnage,	958.	
Contents of bunkers in tons of coal,	740.	
Masts and rig—Barque.		
Engines.—Vertical direct.		
Diameter of cylinders,		48 inches.
Length of stroke,		2 feet 3 "
Maximum pressure of steam in pounds,	10.	
Maximum revolutions per minute,	56.	
Boilers.—Two—Horizontal return tubular.		
Length of boilers,		10 feet 6 inches.
Height " exclusive of steam chimney,		15 "
Number of tubes,	432.	
Internal diameter of tubes,		3 "
Length of tubes,		6 " $9\frac{3}{4}$ "
Diameter of smoke pipe,		5 "
Description of coal,	Bituminous.	
Propeller.—		
Diameter of screw,		12 " $6\frac{1}{2}$ "
Pitch of screw,		19 "
Number of blades,	3.	

Remarks.—Has wrought iron plate stringers on each deck, and frame ties $2\frac{1}{2} \times \frac{3}{4}$ inch; 12 inches apart in lower hold; also, five water-tight bulkheads. Carries 626 tons of cargo and 4200 gallons of water in bunks.

C. H. H.

Preparation of Calcium.

MM. Lies-Bodart and Jobin announce to the Academy of Sciences at Paris, that they had succeeded in preparing calcium in a purely chemical way, by heating the iodide, with potassium in an iron crucible, closed by a cover screwed on air-tight.

This mode may be at present convenient to chemical professors and students who do not often see this metal, and the fact evolved, that this re-action takes place under high pressure, which it does not under the pressure of the atmosphere, may perhaps lead to results more important on the large scale of industry.

For the Journal of the Franklin Institute.

Particulars of the Steamer Baltimore.

Hull built by John A. Robb. Machinery by Murray & Hazlehurst, Baltimore, Maryland. Intended service, West Indies.

HULL.—

Length on deck from fore part of stem to after part of stern post above the spar deck,		150 feet.	
Breadth of beam at midship section, above the main wales,		20 "	6 inches.
Depth of hold,		8 "	6 "
" to spar deck,		15 "	
Floor timbers at throats, *molded,*		11 "	
" " *sided,*		8 "	
Frames, distance apart at centres,		2 "	3 "
Depth of keel,			6 "
Draft of water at load line,		10 "	6 "
" below pressure and revolutions,		10 "	
Area of immersed midship section at this draft,		170 sq. ft.	
Tonnage,	252.		
Contents of bunkers in tons of coal,	50.		
Masts, 3.—Rig—Foretopsail schooner.			

ENGINE.—Vertical direct.

Diameter of cylinders,			35 inches.
Length of stroke,		2 feet	3 "
Maximum pressure of steam in pounds,	30.		
Maximum revolutions per minute,	75.		

BOILERS.—One—Single return tubular.

Length of boiler,		14 feet.	
Breadth "		9 "	
Height " exclusive of steam chimney,		11 "	8 inches.
Number of furnaces—two.			
Length of grate bars,		5 "	
Number of tubes,	74.		
Internal diameter of tubes,			3¾ "
Length of tubes,		10 "	
Heating surface,		1000 sq. ft.	
Diameter of smoke pipe,		3 feet	10 "
Height " from top of boiler,		34 "	
Description of coal,	Anthracite or bituminous.		
Consumption of coal per day,	7 tons.		

PROPELLER.—

Diameter of screw,		9 feet.	
Length of blades,		2 "	
Pitch of screw,		18 "	
Number of blades,	3.		

Remarks.—Has two bulkheads.

C. H. H.

Origin of Bituminous Schists.

M. A. Riviere communicated to the Academy of Sciences at Paris, at their Session of 25th October, 1858, a curious observation which had led him to a new theory of the origin of certain rocks of the crust which are found to contain a small quantity of combustible matter.

He was first struck by the resemblance between these rocks and the earth saturated with ordinary coal gas by the leakage of the pipes which convey it. By a series of experiments he found,

1st, That the soil surrounding the pipe, was in certain circumstances, and after some time, more or less impregnated with carbon and bitumen, so as to become sometimes very combustible, and as black as impure coal.

2d, That the nature of the soil had much influence on the absorption; thus, whilst a clayey, slightly damp soil charged with vegetable or animal debris favored this absorption, it was, on the contrary, but slight in dry sand.

3d, That the thickness of the upper strata favored absorption.

4th, That it was greater near the cracks and stratification joints.

5th, That the absorbing materials increase in weight and sometimes in bulk.

6th, That the vegetable matters were gradually converted into carbon more or less bituminous according to circumstances.

7th, That the ferruginous materials were altered, more or less converted into oxides, sulphates or sulphites; and that they would probably have been converted into sulphurets and carbonates, had the gas been less purified, and had the action been sufficiently prolonged and the circumstances favorable.

The immediate means to be taken for the Relief of Workmen Smothered in Wells. By M. P. Doré, formerly Preceptor in Chemistry at the Polytechnique School, Paris.*

In consideration of the numerous accidents of this nature which happen daily, we cannot too forcibly call attention to the simplest means of preventing fatal consequences.

1. When a workman has fallen fainting at the bottom of a well, while some one is sent for the nearest physician, the person who is to descend into the well in order to bring up the suffocated man, should prepare, by tying over his mouth a bag of muslin filled with dry lime and Glauber salts (sulphate of soda,) quickly powdered and intimately mixed. This precaution is destined to prevent the vitiated air of the well from making another victim. (S. Girardin de Rouen, *Leçons de Chimie*, p. 39.)

2. That done, it is necessary to let down at the same time and in advance of the rescuer a lighted candle, to determine at what depth the layer of vitiated air commences—and the second man should not be left at the bottom of the well longer than the time strictly necessary to permit him to attach to the fainting man a second rope, which has been let down in the meantime.

The man having been brought to the surface, if the physician has not arrived, the following directions should be observed:

* From "Les Nouvelles Annales de la Construction."

3. Expose the patient in the open air, naked, without fear of the cold or the rain, placing him on his back, the head and the chest elevated.

4. Throw with much force over the surface of the body, and particularly over the face and chest, tepid water, or even cold water if in summer, continuing to do so until respiration commences.

5. In the meantime rub the body, and especially the chest, with cloths dipped in vinegar and water, cologne water, or even brandy. Every four or five minutes dry the body with warm cloths, and then continue the friction and the dashing with water.

6. Rub with a brush the soles of the feet, the palms of the hands, and the spine.

7. Cause him to smell hartshorn at intervals, without allowing the bottle to remain for too long a time under his nose.

8. Finally, if the suffocation has taken place in a foul well in consequence of sulphuretted hydrogen, it will be useful to pass under his nose a vessel containing chloride of lime and vinegar, or a solution of chloride of potassa.

Such should be the treatment of the patient while waiting for the arrival of a physician.

In order to assure those who find it necessary to give assistance in such cases that they cannot employ too fully the dashings of cold or tepid water, we cite the following case, observed in the winter of 1802, of a nurse in the "Hospital Murat" at Narbonne, by Doctor Darbon, then physician to that hospital.

It was noticed one morning at the time of inspection, that one of the nurses was absent. On going to his chamber they found him suffocated by the fumes of charcoal. Every remedy was applied, and still at two o'clock in the afternoon the patient had given no signs of life. Then Dr. Darbon commenced dashing tepid water over him with violence, using a sauce-pan with a long handle, which gave great force to the dashes of water.

At the end of *four hours* of this treatment, the patient revived, was placed in a warm bed and carefully attended to, and in four days resumed his duties.

We may add that M. Bourgeois mentions a case where the patient only revived after *twelve hours* of this treatment. F. R.

New Copying Telegraph of M. Bonelli.

Many months ago the editor of the *Cosmos*, a Parisian weekly journal of great excellence, announced, with no little pomp, the invention of this apparatus by M. Bonelli, and pronouncing it entirely different and very superior to any thing hitherto known, promised a precise description in the next number. After awhile another article began the fulfilment of this promise by a history and criticism of known instruments, in which there was nothing new but the unfairness towards the

inventors. This article was to be continued in the next number, when we were to have at last the description of the new wonder, but from that time until the number of 17th September, no word has been seen about it. And now we have, not a continuation of the former grand flourish, but a new article beginning "still another telegraphic marvel." Then follows at last a description of the Bonelli invention, which, it appears is the same as that invented by Bakewell, in England, and long known here; in which the electric current passing through an iron wire decomposes yellow prussiate of potassa, and deposits Prussian blue, thus writing in yellow letters upon a blue ground, (Abbè Moigno says green,) when the original despatch is written upon metal or paper soaked in a metallic salt with a varnish ink. The only difference is, that whereas the old conductor was a single wire, Bonelli's is a rope of from fifty to sixty insulated wires, which are spread into brushes at their end, and the different parts of the despatch are thus copied at the same time, and the article is done in one-fiftieth or sixtieth of the time. This is ingenious and important; the only question is, whether the improvement will pay for the increased expense. The Abbè estimates the expense of the new conductor at from 1000 to 1200 francs per kilometre; that is, from \$320 to \$390 per mile. If it can be put up for this, it will probably be an improvement on our present systems.

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*Steatite Gas-Burners.**

M. Schwartz, of Nuremberg, has succeeded in manufacturing gas-burners of steatite or soapstone; the following description of which is given by *Le Génie Industriel*:—

"The materials hitherto used in making gas-burners, such as iron, brass, &c., possess the inconvenience of oxidizing during the combustion of the gas, and in a short time the holes or the slits become enlarged, the burners consume a larger quantity of gas, and the flame is less brilliant. Burners made of porcelain, which substance has been proposed as a substitute for metals, have not answered so well as was expected, because that material becomes rapidly porous by heat. These inconveniences suggested to M. Schwartz the idea of making burners of the steatite or soapstone that is found at Gopfergrün, in the district of Wensiedel, in Bavaria; which, according to the analysis of Professor Kaiser, consists of 30 parts of magnesia, 60 of silica, 5 of water, and 3 of the oxide of iron.

"This substance is cut into rectangular pieces, which are put into a muffle that is hermetically closed. It is then exposed to heat for four or five hours; the heat being at first slack, but afterwards raised till the muffle is red hot. This operation requires great care, because the stone easily splinters; and it is on that account that a moderate heat is at first used to expel the water. The higher temperature is not employed until that is effectually done, after which the violent heat is kept up for two hours. All impure pieces of steatite must be carefully

* From the Journal of Gas Lighting, &c., Aug., 1858.

thrown aside; those, for instance, which have ferruginous streaks, or argillaceous specks.

"After this preparatory process, the calcined stone is put on a lathe to reduce it into form, and as the steatite does not completely lose its property of absorbing moisture from the air by the first calcination, the burner is then immersed in pure oil, in which it is boiled till it becomes of a dark brown color. It is then dried, and is polished with a lock of wool. In cutting and piercing the burner, advantage is taken of the natural cleavage of the stone, of which the workman soon learns how to avail himself.

"The principal constituent elements of steatite, the silica and magnesia, resist the heat to which they are subjected without change, and consequently remain unaltered by the highest temperature to which they are exposed in the burning of gas. The process of calcination, by depriving the stone entirely of the water it contained, seems to render it more compact. Steatite also possesses the property of contracting by heat, and after four or five days use the holes or slits of the burners are not increased in size. This fact has been proved in burners that have been kept constantly in action for eight weeks, at the end of which time a kind of varnish or glaze, of a flinty character, was collected on the edges of the slits.

"Professor Liebig recommends the steatite burners for use in chemical laboratories. That eminent chemist is of opinion that these burners possess the advantage over metal ones, that the height of the flame can be regulated most exactly without any flickering, and, the flame being steadier, it can be more enlarged."

Accidental Production of Colors in Photographs. By M. Muguet.

"I will state the circumstances under which I obtained natural colors, in taking, the other day, a stereoscopic picture of some ruins covered with ivy. Each glass plate had been exposed twenty seconds, the sun shining brilliantly, and on developing I was astonished at finding the color strongly developed: the ivy was represented by a deep green tint, some old timber of trees by a brown, the stones by a gray; all with colors in the highest degree varied. Fixing did not alter them, but in drying, they lost their brilliancy, with the exception of the green, which has remained as decided as at first. In taking a second picture the same effect was produced, but with less strength.

The collodion was, perhaps, two months old, nearly colorless, and gave a thin coat. It was prepared by Mr. Robinson, chemist, who assured me that he had iodized it with iodide of potassium with a little bromine.

The bath was a neutral solution of crystallized nitrate of silver. I had developed with a solution formed of two grains of pyro-gallic acid, 20 drops of acetic acid dissolved in one ounce of water, and fixed by a concentrated solution of cyanide of potassium."

M. Raymond remarks that if, as soon as a collodion picture begins

to develop clearly under the combined action of pyro-gallic and acetic acid, it be exposed to the light without previous drying, it is rapidly changed into a positive picture, and takes more or less perfectly the colors of the model. The stronger the light is, and the less the development of the picture, the more rapid but at the same time the less perfect is the transformation. A picture accidentally made in this way was completed in a quarter of an hour, and lasted some months with scarcely any loss of brilliancy, and even now, after more than two years standing on a shelf in the laboratory, it is not completely effaced.

In reference to this communication, M. Bertsch reminded the hearers, that every photographer had frequently observed that when the development of a direct positive was arrested at a certain point, and the picture placed on a black ground, effects were obtained which imitated the natural color very well. The whole picture takes on a rose-color, which imitates tolerably well the tones of the face; and as the hair and dress, which are darker than the face, are but slightly brought out, they allow the black color of the ground to appear through them, and thus produce the appearence of a coloring which does not in reality exist.—*Cosmos.*

A Lunar Tide upon Lake Michigan.

The annual meeting of the Chicago Historical Society was held last evening at the house of Hon. I. N. Arnold, on Erie Street.

Among other important facts communicated, Colonel Graham stated, as the result of a long and carefully conducted series of observations, his discovery of a lunar tidal wave upon Lake Michigan. From the comparatively small area of the body of water acted upon by the lunar influence, the co-ordinate of altitude could not be but small. This circumstance, added to that of the almost constant disturbance of the lake surface by winds, renders this co-ordinate of altitude measurable only in calm weather, and when the moon is in conjunction with or in opposition to the sun. At such times its average is about two-tenths of a foot, or say $2\frac{1}{2}$ inches.

This announcement will be a matter of much interest to the scientific world generally.—*Chicago Daily Journal, Dec.* 1, 1858.

Preparation of a Detonating Compound of Silver by means of Coal-Gas.

By MM. Vogel and Reischauer.

If a current of ordinary coal-gas be passed through a neutral solution of nitrate of silver, the liquor soon becomes troubled and a crystalline precipitate is deposited. Under the microscope this precipitate is seen to be composed of a mass of small prisms, but its dominant property is that, after drying, it explodes as violently as fulminating

silver by heat or by the hammer. It however is distinguished from the fulminate of silver by the form of its crystals, its behavior with boiling water, its decomposition by potassa, and the quantity of silver which it contains; but especially by the fact that it is entirely decomposed by chlorhydric acid with evolution of a gas, which is combustible, and has the penetrating and peculiar odor of coal-gas. By means of this reaction the author determined the content of silver, and found from 78·3 to 84 per cent.

If the solution of nitrate be acid, the amount of precipitate is much diminished. If the acetate be used, a gray compound is formed which detonates, but less violently than that from the nitrate. By continuing to pass the gas through an acid solution of acetate of silver for several days, the silver was so completely precipitated, that the liquid gave no precipitate with chlorhydric acid.

If the gas from the decomposition of the precipitate from nitrate of silver by chlorhydric acid, be passed through another solution of the nitrate, it forms a brilliant white precipitate of microscopic crystalline needles. This precipitate also detonates with great violence.

As this compound burns with great difficulty by oxide of copper, the authors did not succeed in analyzing it; but hope to do so by the examination of the gas evolved by chlorhydric acid.

They remark also that the formation of this body seems to depend on the nature of the gas; so that sometimes the first bubbles of gas produce considerable turbidity, while at other times, it is only after some hours, that the action is manifested.—*Academy of Sciences of Munich*, 16*th January*, 1858.

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*Process for Obtaining Aluminium.** Patented by LUIGI FERRARI CORBELLI. January 26, 1858, in London.

By the improved process the metal is obtained direct from argillaceous earth or clay, which after being well washed and cleansed from extraneous matters, such as stones, sticks, leaves, and such like substances, is submitted to the following process:—Take one hundred grammes of the well-washed clay, and after well drying it, dissolve it in about six times its weight of concentrated sulphuric acid or very strong hydrochloric acid. Dry the clay again, and heat it in an earthen vessel up to four hundred and fifty or five hundred degrees of the centigrade thermometer, after which mix with it two hundred grammes of yellow prussiate of potash, which should be quite dry and pulverized. The quantity of this material that should be added to the clay, will depend in some measure upon the quantity of siliceous matter contained in the clay. To this mixture add one hundred and fifty grammes of common salt, and place all the ingredients when intimately mixed together in a crucible. Heat them up to a white heat, and after the mass is cool, the aluminum will be found at the botton of the crucible.

* From the London Repertory of Patent Inventions, No. 778.

A New and Economical Furnace.

The principle of M. Beaufumè's furnace is, the production of inflammable gases by the distillation of the combustible, in a separate apparatus, and the conduction of these gases to be burned in the furnace in place of the fuel itself. The apparatus is said to have been already employed for plaster and porcelain furnaces, and to have produced an economy of 30 and in some cases of 60 ℔ cent.; and in other experiments to have evaporated 10·544 k. ($23\frac{1}{4}$ lbs.) of water under a mean pressure of 4 atmospheres, with a consumption of 1·5 k. ($3\frac{1}{3}$ lbs.) of coal per hour; whilst with the same charge of fuel, the ordinary furnaces vaporize on an average not more than 6 k. ($13\frac{1}{4}$ lbs.) The furnaces are also much less liable to be burned than with ordinary fuel.

Cosmos.

Improvements in the Treatment or Preparation of Moulds for Casting Metals. Patented by ANDREW and THOMAS WALKER. January 19, 1858, in London.*

Our said invention relates to the treatment or preparation of the surfaces of sand moulds for casting metals by means of anthracite, "blind," or "stone" coal dust. The coal or mineral preferred for this purpose is anthracite, but any coal of an anti-bituminous kind will answer for carrying out the improvements. The coal or anthracite mineral is used in its natural condition, as dug from the earth, being merely reduced by mechanical means to the proper condition of powder or dust. The powder or dust is placed in permeable bags, and dusted upon the mould surfaces with which the metal will come in contact when the casting operation takes place. The same material may also be used as a wash for moulds; it may also be employed mixed with sand, as in the case of common coal-dust. This system of preparing mould surfaces secures economy in the materials used, whilst it also enables the founder to produce extremely sharp and fine castings.

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*Improvements in Submarine Conductors of Electric Telegraphs.** Patented by JOHN CORNISH HARCOURT SIEVIER. February 13, 1858.

My invention consists in coating copper wire to be employed as a submarine conductor of electricity with bismuth, tin, iron, lead, brass, antimony, zinc, nickel (by preference containing arsenic), or German silver, or with any combination or alloy of two or more of these metals, prior to the treatment of such copper wire with any means of insulating, either by gutta percha, shellac, tar, bituminous or resinous substances, fibrous materials, or other substances, and likewise prior to the application of the wire cable. Copper being a powerful conductor of electricity, my object is to coat copper wire with a metal or alloy or combination of metals having a much less degree of conductibility than

* From the London Repertory of Patent Inventions, No. 778.

copper, in order that the copper may become more easily insulated than it would otherwise be if surrounded or encased as usually with gutta percha or other insulating materials, without being first coated with a metal or alloy or combination of metals having comparatively slight degree of conductibility.

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*Lecture on Rotary Stability and its Applications to Astronomical Observations on board Ships.** By the Rev. Prof. BADEN POWELL.

The object of the discourse was to explain an apparatus recently contrived, for the purpose of giving perfect stability for the nicest astronomical observations on board a ship pitching and tossing with every wave and gust of wind. This contrivance has been the result of a principle of rotary motion, which, although long since understood and acknowledged in theory, has been but lately considered with regard to its practical results, and when first tangibly exhibited in the gyroscope or free balanced revolver, had excited unbounded surprise. It was forgotten how perfectly similar, and equally paradoxical in its nature, is the common and familiar result of a top sustained by the mere act of spinning in a position from which it directly falls when the rotation ceases. On a former occasion, on the 3d of March, 1854, the Professor brought under the notice of the members the principle of "composition of rotations," and those applications of it which had been formed in certain rotary phenomena of projectiles, illustrated by the gyroscope in its several earlier forms, as successively modified by Bonenberger, Atkinson, Fessel, and Wheatstone, showing the identity of those results on a small scale, with the grand cosmical phenomenon of the precession of the equinoxes. Since that time the same principle had been applied by M. Foucault to prove the earth's rotation on its axis, and which the lecturer said had been pointed out eighteen years before, by Mr. Sang, of Edinburgh, and only not practically accomplished from the expense of the necessary apparatus. The rotary apparatus, which the lecturer proceeded to explain, for giving an invariable plane or platform for astronomical instruments used at sea, was invented by Prof. C. P. Smyth. Two simple first principles in dynamics give the clue to the whole of the applications. 1. The tendency of a body in rotation to retain that rotation in the same place, when perfectly balanced, irrespective of the motion of external objects, which is termed "the fixity of the plane of rotation." 2. "The composition of rotary motion," or that when a force is impressed on a body in rotation, it does not show itself directly, but is compounded with the fixed motion, so that the rotation takes an intermediate direction, or the axis shifts its position in space. This being the cause of the motion of the earth's axis, giving rise to the precession of equinoxes, it is generally called a "precessional motion."

One of the most important desiderata of nautical astronomy has always been the means of observing at sea the eclipses of Jupiter's satellites—so frequently recurring, and affording so simple and direct

* From the London Practical Mechanics' Journal, October, 1858.

a means of obtaining the longitude. Stability on board ship is essential to this, and many schemes have been invented for the purpose of supporting the telescope, and the observer with it, so as to be free from the motion of the ship. In general, to procure this stability, it seemed an obvious resource to suspend any object which it was desired to keep steady by cords from a fixed point in the vessel. But a body thus suspended is like a plumb line; when the point of support is itself set in motion, it acquires a part of that motion, and becomes a pendulum, and it oscillates more irregularly and violently, from the accumulations of motions impressed upon it continually by every fresh motion of the ship. Nairne's or Trwin's "marine·chair" for carrying the observer and the telescope was simply an application of this principle. It was found not to answer, as the principle upon which it was constructed tended to perpetuate disturbances rather than destroy them. In these cases the centre of gravity is *below*. If it were suspended in gimbals, so that the centre of gravity should be at the point of suspension, the tendency to oscillate from this cause would be overcome. But still any slight cause might disturb the level; there would be no principle of permanent stability. Thus, to produce this desirable stability for a place or stand on which the telescope is to be rested, we must have recourse to the free revolving disk accurately balanced within gimbals, on its centre of gravity. The balancing must be perfected by means of the adjustable plugs before-mentioned, both in the disk, and in the gimbal frames; the pivots of the gimbals must be of perfect workmanship, to turn with the least possible friction, yet without looseness or displacement. An immense rotary velocity must be communicated to the disk by machinery, of which its suspension must be quite independent, so that the moving power can be instantaneously withdrawn. The Professor stated, that all these conditions are fulfilled in the form of the machine, which, after repeated trials, has been adopted by Prof. Smyth, exhibited by him at the Paris Exhibition, 1855, and successfully tried on board Mr. Stephenson's yacht, "*Titania*," on his voyage to Teneriffe, in 1856. A free revolving disk in gimbals, externally turning on pivots horizontally resting on supports fixed to the deck, will suffice to preserve the telescope from all deviation due to pitching and rolling. The addition of another disk, freely revolving in a vertical plane, whose external pivots turn vertically in a frame attached to the top of the former internal frame, the upper pivot projecting through it, and carrying a small platform for the telescope, and the whole, of course, balanced below, will preserve the telescope from any lateral deviations of the ship. And the combination of the two will give a plane retaining its parallelism against all those causes of disturbance. But under favorable circumstances this last cause of disturbance is but small, so that this addition may often be of little importance. Thus we have the whole construction of what the inventor designates as "the compound precessional free revolver stand."

The Professor concluded by taking a summary view of the whole subject. By direct consequence from the simplest acknowledged mechanical principles, the gyroscope, when its equilibrium is slightly disturbed,

demonstrates the precession of equinoxes, explains the boomerang, and sustains itself in the air against gravitation. When its equilibrium is undisturbed, it exhibits to the eye the actual rotation of the earth; and when restricted to one plane, it acts as a magnetic needle without magnetism, or spontaneously rotates in parallelism with the earth. To these remarkable, diversified, and somewhat paradoxical applications, there is now added another of far higher utility—that it gives perfect stability for the nicest astronomical observations on board a ship pitching and tossing with every wave and gust of wind.

Before the Royal Institution.

For the Journal of the Franklin Institute.

Chemical Examination of the Commercial Varieties of "Common Salt," or Chloride of Sodium. By CAMPBELL MORFIT.

Referring to the composition of the natural sources of the commercial varieties of chloride of sodium, such as salines, bay and sea waters, it is very reasonable to suppose that the derivative substance should comprise all or many of the constituents of the original material. These constituents are chlorine, bromine, iodine, fluorine; sulphuric, nitric, phosphoric, boracic, and silicic acids; sodium, potassium, magnesium, calcium, aluminum, iron, oxygen, and insoluble matter. Though only a portion of those that may be present are in appreciable amount, the examination was very exact, and with a view to detect any or all of them, however minute might be the trace. As lead and copper vessels are sometimes used in the manufacture of salt, there was also a search for any traces of those metals that might have been thence derived. The proportion of accidental water was likewise determined.

Fluorine.—This element was not found in any of the specimens, notwithstanding the great care with which it was sought. One hundred grammes of salt were dissolved in pure water and treated with a solution of chloride of calcium. The precipitate was collected on a filter, and after being thoroughly washed, rinsed off into a leaden cup and heated upon the sand bath, first to expel water, and then with sulphuric acid under a glass cover for some hours, but without obtaining the least corrosion of the glass. The salt was not treated directly, because the large quantity necessary to give an accurate result causes a copious elimination of chlorine, which would interfere with the reaction, and be otherwise inconvenient and disagreeable. Doubtful, too, whether the fluorine existed wholly or only partially in soluble combination, I preferred treating together both the insoluble residue of the salt and the precipitate formed from it, by chloride of calcium which carries down any fluorine that may be present.

Iodine.—Previous experimenters have reported the presence of this element in some salts, but I could not detect it, though I applied the most delicate tests, and operated on the large quantity of 100 grams. It remains, doubtless, with the bromine in the mother water.

My first essays were with chloride of palladium, which was added to a clear and dense solution of 100 grammes of salt: but even after a

night's repose under paper cover to keep out dust, not the least precipitate or cloudiness ensued, as should have followed from the presence of even as small a quantity as 0·0001.

To make assurance doubly sure, this essay was checked by Moride's test, which consisted in adding two drops of fuming nitric acid to a portion of the above made solution of salt, shaking well, and pouring in one drachm of benzole previous to a second shaking. Benzole being an eminent solvent of free iodine, rises to the surface, and assumes a bright red color in ten or fifteen minutes, if that element is present. More than the above quantity of acid should not be used, else chlorine will also be liberated and mask the color; nor must the test be heated or exposed too long to air, for the iodine will volatilize and leave the benzole colorless. This test is delicate to 0·0002 of iodine, as was verified by actual experiment.

This mode not only serves for a qualitative test, but for the quantitative estimation of the iodine, as the benzole will contain all that may be present, and need only to be removed with the pipette, washed with water, and treated with nitrate of silver. The iodide of silver must then be filtered off and washed with alcohol of 0·86. The bromine and chlorine, not being soluble in the benzole, remain in the liquid and wash-water, and may be separated therefrom by the usual process.

Bromine.—This element is almost universally associated with iodine, so that where one is found the presence of the other may be suspected, and vice versa. I did not succeed in detecting even traces. My experiments were with Reynoso's effective test, which is based upon the fact that oxygenated water decomposes hydriodic or hydrobromic acid, but has no action upon the liberated iodine or bromine. A piece of deutoxide of barium having been placed in a test tube is to be drenched with ether, and a few drops of pure hyhrochloric acid and starch solution added; in a few moments the hydrochloric acid acts upon the peroxide of barium, oxygenated water is formed, and bubbles are evolved. At this time a portion of the clear and dense solution of 100 grammes of salt is added and mixed thoroughly by shaking. If bromine is present it is taken up by the ether, which rises to the surface colored yellow, while the iodine, its associate, remains as the lower stratum with the starch, and tints it blue.

Nitric Acid.—If the salt contains any nitrate it must be in very minute proportion, and happily there is a test for detecting traces. It is known as Higgins', and is founded upon the elimination of iodine from hydriodic acid by nitric acid, and its subsequent action upon starch. It is accurate to 0·0005.

The hydriodic acid is formed by the action of sulphuric acid on iodide of potassium. The test was prepared by dissolving an half gramme of iodide of potassium in distilled water; and in order that the liquor may not be strong enough to eliminate the iodine from the action of sulphuric acid alone, it must be diluted until its volume amounts to five fluid ounces. A portion of the clear and dense solution of 100 grammes of salt was then mixed with about one-tenth of its volume of

sulphuric acid heated on the sand bath *nearly* to boiling, for five minutes, then *perfectly* cooled in water to about 50° F., and heated with a drop or two of starch solution, and a few drops of the test liquid. The heat must be less than boiling, so that chlorine may not be generated to produce a blue color; but care must be observed to continue it for some minutes in order to insure the elimination of all the nitric acid; and the sulphuric acid solution should not be stronger than above directed, else it will produce iodine reaction in the most dilute solution of iodide of potassium, even without the presence of nitric acid. The sulphuric acid on the sides of the tube should also be washed down previous to the addition of the iodide of potassium.

A bluish tinge indicates the presence of nitrate, provided it becomes evident within twelve minutes, for a longer exposure to the air decomposes the hydriodic acid eliminated from the iodide of potassium, and sets free the iodine to color the starch. If the tint is not apparent in twelve minutes, the inference is no nitrate, for this test detects 0·0005, or less.

Boracic Acid.—This acid, though cautiously looked for, was not to be found. I followed the plan of strongly acidulating a very dense solution of the salt with hydrochloric acid, and then testing it with turmeric paper. After the paper had been immersed some thirty minutes, it was taken out and dried at 212° F. When borate is present, the paper on drying will assume a deep red or brown color; and as boracic is the only acid that thus colors turmeric paper like the fixed alkalies, this behavior is very reliable and exact, even to less than a thousandth.

Potassa.—As potassa salts are supposed to have a material influence upon the quality of commercial chloride of sodium, even when they are in minute proportion, care was observed to examine for the slightest traces. I, therefore, took the comparatively large quantity of 100 grammes, triturated it completely in a mortar with relays of common alcohol, and filtered the united liquors. Alcohol of that strength leaves the sulphate of lime and the most of the chloride of sodium with the insoluble residue. The clear filtrate was then treated in the usual manner, with alcoholic solution of chloride of platinum.

I prefer the above mode of dissolving out the potassa salt, for the reason that if an aqueous solution of the whole of the salt is first made, the alcohol added to insure the precipitation of the potassa—platinum chloride, simultaneously throws down much of the chloride of sodium, and the water used for washing it out takes with it also traces of the double chloride. More than traces we never found in any sample, but where the quantity is appreciable it must then be collected on a counterpoised filter, washed with dilute alcohol, dried in vacuo with the counterpoise, and weighed against it.

Copper and Lead.—A fluid once of freshly made and strongly impregnated sulphuretted hydrogen water was added to a portion of dense solution of the salt, and the whole left to repose some hours; but as no black precipitate ensued, the inference was that they contained no lead.

As both metals are precipitated black by sulphuretted hydrogen, it becomes necessary to dissolve the precipitated sulphuret in hydrochloric acid, filter, throw down the lead by sulphuric acid as sulphate, and then test the filtrate for copper.

Water.—The preceding constituents are rarely met with in larger quantities than traces, and this formula as to them has been rather more in reference to a qualitative examination; but water and all others that are henceforth noted exist mostly in weighable proportion, and consequently the process will now be both qualitative and quantitative, revealing in its progress any one if present, and estimating each as it is isolated.

Chloride of sodium does not contain any constitutional water or water of crystallization, but as found in commerce, is always more or less damp according to the care observed in the manufacture and drying of it. When the amount of moisture is large, it seriously depreciates the money value of the salt, and it becomes necessary therefore to estimate it very accurately. To this end one gramme of the finely powdered salt was gently heated in a platinum crucible with the cover on until decrepitation ceased, so as to prevent loss by ejection of particles. The cover being then removed, the heat was continued below dull redness for ten minutes, and the crucible and contents finally weighed. After having noted the weight, the crucible and contents were again heated at a little higher temperature than before, so as to be assured that every trace of water had been expelled, as is known when the second weight shows no loss on the first. By careful management and skilful regulation of the heat, the whole of the water is driven off even from the more retentive magnesian and lime chlorides, if they are present, without the volatilization or decomposition of the least portion of chloride. It is advisable, however, always to check the first result by a repetition of the essay with a new one-gramme portion of the salt.

Sulphuric Acid.—Chlorine and sulphuric acid were estimated exclusively from a new portion of one gramme. For this purpose it was digested in distilled water, filtered to separate insoluble matter, treated with slight excess of nitrate of baryta, left to repose for twelve hours for the entire subsidence of the precipitate, so as to facilitate a clear filtration, filtered and washed thoroughly with hot water. The filtrate was set aside as A. The filter suspected to contain phosphate and carbonate of baryta with the sulphate, was treated first with nitric acid and then washed with hot water to dissolve them out, and the washings set aside as B. The filter, C, was then dried, ignited, and weighed as sulphate of baryta, and the amount of sulphuric acid deduced from it by calculation.

Phosphoric and Carbonic Acids.—The filtrate, B, was then tested for phosphate with aqua ammonia perfectly free from carbonate, but as neither it nor sulphuric acid gave any cloudiness, the absence of baryta compound was evident.

Chlorine.—This element was estimated in the filtrate, A, by treating it with a solution of nitrate of silver in the usual manner.

If the preliminary essays have shown the presence of iodine or bromine, the proportion of these elements, respectively determined, as before directed, must be deducted from the chloride of silver, which, as before estimated, is always mixed with them.

Insoluble Matter.—The filtrate from the chlorine and sulphuric acid essays being mixed with excess of baryta and silver salts, which require tedious manipulation for their removal, it is useless for the estimation of the other constituents, many of which, moreover, are in such limited quantity as to require the large portion of ten grammes to give accurate results. This quantity of salt was therefore carefully weighed out and digested as before, to complete solution in distilled water, filtered and washed with hot water. The filter was D, and the filtrate, E. The former after being dried was ignited and weighed as insoluble matter, which consists mostly of silicates. The latter, or filtrate E, was covered with paper to prevent entrance of dust, evaporated to a very small volume, then acidulated with hydrochloric acid (which will produce effervescence if carbonates are present), and the evaporation continued to dryness, with caution against the admission of dusty particles from the air. After having cooled, it was re-digested with distilled water, filtered and washed with hot water. The filtrate, G, was set aside, and the filter, H, ignited and weighed as soluble silica.

Soluble Organic Matter.—If any soluble organic compound should exist in the salt, its acids, provided they are insoluble in their free state, will be eliminated at this stage of the process, and accompany the silica as dark flocculæ, which burn off during the ignition of the filter, and therefore leave the calx white. The proportion of them is rarely appreciable.

Lime.—The filtrate, G, was first treated with a little muriate of ammonia, and then supersaturated with carbonate of ammonia to precipitate the alumina and iron with the lime, while the magnesia would be kept in solution by the ammoniacal salt added and formed during the reaction. As carbonate of ammonia, when in excess, will retain a portion of the iron dissolved, and as it is very difficult also to produce an entire separation of the lime from the liquid owing to the probable formation of a little bi-carbonate from the decomposition of ammonia carbonate, this contingency must be provided against by evaporating the liquid to dryness, and then largely drenching with very dilute solution of oxalic acid instead of with pure water. Any excess of carbonate of ammonia is thus neutralized, and all the iron previously retained by it, as well as the lime, will fall. The whole was then filtered and washed, and after being tested with a drop of oxalate of ammonia and also of sulphide of ammonium, to be assured that all lime and iron had been separated, the filtrate was placed aside as K.

The filter, M, containing all the lime, partly as carbonate and partly oxalate, together with the iron and alumina, was displaced by pure hydrochloric acid. The filtrate was acidulated with a few drops of chemically pure sulphuric acid, and mixed with four volumes of 93 per cent. alcohol, filtered and washed with dilute alcohol rather than with distilled water, which will dissolve more or less of the sulphate. This sulphate after

being dried was ignited and weighed, and the lime thence calculated. It is necessary always to test the filtrates to be assured of the entire separation of the lime.

A shorter method of estimating the lime would be to precipitate it direct from the salt solution by sulphuric acid and strong alcohol, but chloride of sodium being more or less insoluble in the latter liquid, it goes down with the lime, and the large amount of water required to wash it takes up simultaneously some of the sulphate of lime, and thus leads to error.

The usual process of separating the lime from magnesia, alumina, and iron by oxalate of ammonia, would be too tedious and not very accurate; for as the solution is in the first instance acid, the necessary pre-addition of aqua ammoniæ to neutralize it so as to perfect the insolubility of the precipitated lime—oxalate would endanger the simultaneous deposition of a portion of the iron and alumina, which existing as they do in the salts in such minute quantities must be very cautiously and exactly estimated. Moreover, if any of the lime or magnesia exists as phosphate, the direct use of aqua ammoniæ will throw them down as such, notwithstanding the presence of ammoniacal salts. My reasons for estimating the lime as sulphate is because that combination is constant and not liable like the carbonate to change during ignition.

Iron.—The filtrate from the sulphate of lime containing the iron and the alumina with the excess of alcohol, was evaporated to dryness in a platinum capsule, ignited at low heat to drive off organic matter introduced by the alcohol, and which would otherwise interfere with the subsequent precipitation of the iron, dissolved in water, acidulated with hydrochloric acid, boiled in a silver capsule with pure caustic potassa ley, filtered and *thoroughly* washed with *hot* water. It was then dried, ignited, and weighed as peroxide of iron.

Alumina.—The alumina remaining in the filtrate was separated by neutralizing the excess of potassa in the latter with hydrochloric acid, adding a slight excess of carbonate ammonia, and warming for some hours on the sand bath. When the precipitated alumina had separated in floccul æ, it was filtered off, well washed with *hot* water, dried, ignited, and weighed.

Magnesia.—The filtrate, K, which in the interval had been evaporated upon the sand bath to one-fourth of its original volume, was first treated with ammonia and then with phosphate of soda. The vessel having been covered with paper, was left on the sand bath for some hours. It is always necessary to warm and to allow at least twelve hours repose, for when the magnesia is in minute quantity it will require that length of time for its separation, as it often happens even when liquids contain phosphate, they do not give immediate signs of its presence upon the addition of the re-agents. The ammonia phosphate was then filtered off, washed with dilute ammoniated water, dried, ignited, and weighed. The amount of magnesia was deduced by calculation.

No. 19 E. Twelfth St., New York, 1858.

Chemical Composition of the Commercial Varieties of

RANK.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
COMMERCIAL BRAND; and Source of the Specimen.	Key West Solar, Florida.	St. Martins.	Liverpool Rock.	Kiskiminitas, from Tarentum, Pa.	Oso.
Chloride of sodium,	0·993514	0·985266	0 982713	0·977931	0 975485
Water, ...	0·008000	0·007000	0·005000	0·019000	0·020000
Insoluble residue, . .	0·000050	0·002000	0·006000	0·000200	0·000300
Chloride of potassium, .	—	—	—	—	—
Chloride of calcium, .	0·000119	—	—	0·003017	—
Chloride of magnesium, .	0·000934	0·002123	0 002547	0·000849	0 002123
Sulphate of lime, . .	0·000554	0·000510	0·001700	—	0·001900
Sulphate of potassa, . .	—	—	S. trace.	—	—
Sulphate of soda, . .	—	0·002520	0·000659	—	0·001364
Nitrate of soda, . . .	trace.	—	S. trace.	trace.	—
Silicate of soda, . .	trace.	0·000336	0·000505	0 000252	0·000505
Organic matter, (soluble,)	—	—	—	—	trace.
Iron, ($Fe^2 O^3$,) . . .	0·000800	0·000400	0·001100	0·000200	trace.
Alumina, ($Al^2 O^3$,) . .		0·000200		0·000500	0·002000
Total, . .	1·003971	1·000355	1·000224	1·001949	1·003677

TABLE

RANK.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.
COMMERCIAL BRAND; and Source of the Specimen.	Spencer's boiled, from Syracuse, N. York.	Hope Factory, N. York.	Nassau.	Anguila.	Syracuse Company, N. York.	Tarentum, Pa.
Chloride of sodium,	0·962938	0·962851	0·960321	0·957348	0·956663	0·943494
Water, . . .	0·022000	0·014000	0·011000	0·022000	0 016000	0·040000
Insoluble residue, .	0·000300	0·000600	0·001000	0·005800	0·001800	0·000300
Chloride of potassium,	trace.	—	—	—	—	—
Chloride of calcium,	0·000009	—	—	—	—	0·007541
Chloride of magnesium,	0·002717	0·002123	0.008665	0·002293	0·000509	0·008491
Sulphate of lime, .	0·013992	0·016500	0·004800	0 008600	0·020000	0·002740
Sulphate of potassa,	—	trace.	traces.	—	—	—
Sulphate of soda, .	trace.	0 000667	0·009562	0·004410	0·002978	—
Nitrate of soda, .	—	—	trace.	trace.	—	trace.
Silicate of soda, . .	0 000168	0·000168	0·000673	0·000168	0·000168	0 000336
Organ. mat'r,(soluble,)	trace.	—	—	—	—	—
Iron ($Fe^2 O^3$,) .	0·800800	0·000600	0·000500	0·000200	0·000700	0·000200
Alumina, ($Al^2 O^3$,)	0·001700	0·002000	0·000500	0·001200	0·001300	0·000600
Total, . .	1·004624	0·999509	0·997021	1·002019	1·000118	1·003702

"Common Salt" or Chloride of Sodium. By Campbell Morfit. *One gramme.*

No. 6.	No. 7.	No. 8.	No. 9.	No 10.	No. 11.	No. 12.	No. 13.
Liverpool fine.	Liverpool ground alum.	Cudwell's boiled, from Syracuse, N. York.	N. York.	Kanawha Virginia.	Haskin's salina, coarse, from Syracuse, N. York.	Goose Creek, Kentucky.	Bonaire.
·969917	0·969423	0·968882	0·968488	0·967460	0·965540	0·964276	0·963288
·005000	0 011000	0·012000	0 012000	0·022000	0·014000	0·022000	0·017000
·000400	0·000700	0·000400	0·001100	0·000500	0·000600	0·000300	0·001000
—	—	—	—	S. trace.	—	S. trace.	—
—	—	—	0·002671	0·003257	—	0 007747	—
·006708	0·005774	0·000849	0·002547	0·002887	0·000509	0·001613	0·007132
·010005	0·003011	0·014300	0 015624	—	0·014500	—	0·004000
trace.	S. trace.	—	trace.	—	S. trace.	—	S. trace.
·004330	0·007628	0·003085	—	—	0·000809	—	0·006777
—	—	—	trace.	trace.	—	—	—
—	trace.	trace.	—	0·000421	0·000252	trace.	0·000168
—	—	—	—	—	trace.	—	—
·000500	0·000700	0 000400	0·000800	0·000400	0·000500	—	0·000500
·000600	0·000900	0·001200	0·000500	0 000400	0·001300	—	0·001700
·997460	0·999136	1·001116	1·003730	0·997325	0·998010	0 995936	1·001565

Continued.

No. 20.	No. 21.	No. 22.	No. 23.	No. 24.	No. 25.	No. 26.	No. 27.
Liverpool Ashton.	Turk's Island.	Pomeroy, Ohio.	Curacoa.	Alleghany saline, Penna.	Cadiz.	St. Ubes.	Inagua.
0·941656	0·940776	0·938382	0·929816	0·915437	0·913722	0·890402	0·878509
0·044000	0·032000	0·046000	0·053000	0·064000	0·063000	0·061000	0·096000
0·000500	0·003600	trace.	0·001500	0·000800	0·001700	0·001900	0·005000
—	—	S. trace.	—	—	—	—	—
—	—	0·008971	—	0·013495	—	—	0·004844
0·002462	0·007047	0·005095	0·011036	0·005394	0·010699	0·023870	0·000594
0·012200	0·009400	—	0·002300	—	0·003300	0·009800	0·013059
trace.	traces.	—	trace.	—	traces.	traces.	—
0·001262	0·007530	—	0·007208	—	0·009942	0·014475	—
—	—	—	—	—	trace.	—	trace.
0·000421	—	trace.	trace.	0·000505	0·000252	0·000337	0·000336
—	—	—	—	—	—	—	—
0·000200	0·001000	trace.	trace.	0·000200	0·000300	0 000400	0·000100
0·000200	0·000600	trace.	trace.	0·000200	0·000700	0·000500	0·000200
1·002901	1·001953	0·998448	1·004860	1·000031	1·003615	1·002682	0·998642

Safety for Steamers on Fire.

In almost every instance of destruction of steamers by fire, access to the engine has been cut off; and while the flames are driven aft, by the speed of the vessel, they have no means of obtaining water. Could not a syphon-like pipe be introduced, when the vessel is being built, extending the whole length of the same, through which the water would flow freely, so as to give motion, when necessary, to a hydraulic ram when required?

The highest part of the pipe should be well aft, and it should not be higher above the water line than the point to which the minimum speed of the vessel would cause the water to rise; cocks could then be attached at various places so as to draw water if necessary. E. B.

Brooklyn, New York, January 29, 1859.

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*Experiments on Vegetable Parchment.**

The following are the details of the experiments referred to in article on page 56.

WATER LEAF PAPER,

broke, when loaded with

I.	II.	III.	Mean.
17 lbs.	15 lbs.	15 lbs.	15·6 lbs.

VEGETABLE PARCHMENT,

broke, when loaded with

I.	II.	III.	Mean.
78 lbs.	75 lbs.	70 lbs.	74 lbs.

ANIMAL PARCHMENT,

broke, when loaded with

I.	II.	III.	Mean.
92 lbs.	78 lbs.	56 lbs.	75 lbs.

The strips of vegetable and animal parchment were selected as nearly as possible of equal thickness, but the strips of artificial product were somewhat heavier than those of real parchment. On an average, the former weighed 18 grains, and the latter only 12·75 grains. Calculated for equal weights, the strength of animal parchment as compared with that of artificial parchment, is obviously $\frac{18}{12{\cdot}75} + 75 = 105$. In round numbers, it may be said that vegetable parchment has three-fourths the strength of animal parchment.

* From the Journal of the Society of Arts, No 313.

Discharge of Water by the Seine.

By means of the Pitot tube, the engineers have found that the quantity of water discharged by the Seine during the present summer, (1858) that is, at a very low level, is 45,592 litres (12,000 gals.) per second. In the month of October of last year, the river being some centimetres above its average, the flow measured at the bridge of Pecq was 102,332 litres (27,000 gals.) per second. *Cosmos.*

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, January 20, 1859.

John C. Cresson, President, in the chair.

John Agnew, Vice President. } Present.
I. B. Garrigues, Recording Secretary. }

The minutes of the last meeting were read and approved.

Donations to the Library were received from the Royal Geographical Society, the Royal Astronomical Society, the Chemical Society, and the Society of Arts, London; K. K. Geographischen Gesellschaft, the Oesterreichischen Ingenieurs Verienes, Vienna, Austria; the Smithsonian Institution, and Charles Ellet, Jr., Esq., Washington City, D. C.; Hon. H. M. Phillips and Hon. T. B. Florence, U. S. Congress; B. H. Latrobe, Esq., and the Maryland Institute, Baltimore, Md.; Dr. B. A. Gould, Albany, New York; Charles B. Norton, Esq., City of New York; C. A. Walborn, Esq., Penna. Legislature; Prof. J. F. Frazer, Prof. B. H. Rand, John E. Addicks, Esq., and E. T. Freedley, Esq., Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement for December, 1858, and his annual statement for 1858 were read.

The Board of Managers and Standing Committees reported their minutes.

Candidates for membership in the Institute (3) were proposed, and the candidates proposed at the last meeting (141) were duly elected.

The Tellers of the Annual Election for Officers, Managers, and Auditors, for the ensuing year, reported the result, when the President declared the following gentlemen duly elected:—

John C. Cresson, President.

John Agnew, } Vice Presidents.
Matthias W. Baldwin, }

Isaac B. Garrigues, Recording Secretary.

Frederick Fraley, Corresponding Secretary.

John F. Frazer, Treasurer.

MANAGERS.

Samuel V. Merrick,	Thomas J. Weygandt,	James H. Bryson,
Thomas Fletcher,	Joseph J. Barras,	Ellis S. Archer,
Edwin Greble,	Joseph Harrison,	John M. Gries,
Thomas S. Stewart,	George Erety,	James Dougherty,
Alan Wood,	Evans Rogers,	George Whitney,
John E. Addicks,	Robert Cornelius,	Edward P. Eastwick,
Isaac S. Williams,	Lawrence Johnson,	Washington Jones,
George W. Conarroe,	William Sellers,	William H. Love.

AUDITORS.

Samuel Mason, James H. Cresson,
Samuel B. Finch.

At a meeting of the Board of Managers, held January 26th, 1859, the following officers were elected for the ensuing year:

Joseph Harrison, Chairman.

Isaac S. Williams, } Curators.
James H. Bryson, }

The attention of the President was called to the remonstrance against the introduction of gas-lighting, reported a day or two back in the daily papers as having been presented to the City Councils by himself and others in the year 1833.

In reply, he said it was true that he had signed such a paper, in company with several hundreds of his fellow citizens, and, moreover, that the statements there set forth as to the dangers and annoyances of gas manufacture were literally true at that day, he being able to testify, after personal inspection of nearly all the gas factories established prior to that period, that their condition was such as would cause them now to be considered intolerable nuisances; for the modes of manufacture and distribution were so imperfect, that gas was not thought fit to be admitted into private dwellings. The effect of the strong opposition to its introduction here, in that offensive manner, was such as to induce Councils to adopt the wise course of sending a competent agent to Europe to collect information on the subject and procure plans of all the best improvements there to be discovered. The person selected was Samuel V. Merrick, Esq., a gentleman admirably qualified for the mission, and he made such good use of his opportunities as to return in a few months with a fund of practical knowledge more extensive and complete than was then possessed by any other individual at home or abroad. He had been successful in obtaining access to all the principal gas works in England and Europe, with permission to examine fully their plans and processes, on condition that he should not publish nor reveal them to neighboring rivals. The various inventions and improvements thus discovered were combined for the first time in the plans for the Philadelphia Gas Works. They were of such value as to remove most of the serious objections to gas-lighting, and many of its former opponents, the speaker among them, united in recommending and promoting its immediate introduction, under municipal regulations, framed by the chairman of the special committee of Councils, F. Fraley, Esq., by which the city was effectually secured from any pecuniary risk, while retaining all needful control over the management of the enterprise.

If the actions of men are to be estimated by their results, then are these remonstrants entitled to approbation and grateful remembrance, not only in Philadelphia, but also in every place where gas is used; for the valuable improvements first exhibited in combination in the works constructed here, have been copied every where in the United States, both in works since founded and in those previously in operation, the latter having been entirely remodeled, and their engineers instructed according to Philadelphia methods. Nor have these benefits been confined to America; they have been returned to Europe, with

liberal additions to the improved plans originally derived from the older establishments.

With regard to the appropriateness of the comparison laid between this case and that of the railroad under argument, into which it was introduced, the speaker declined expressing any opinion, further than to suggest, that if the analogy intimated by the learned counsel by whom the remonstrance has been exhumed really exists, it would constitute a valid reason for pausing in our career of city railroads, until a general system can be matured on principles founded on public convenience, rather than the mere private interests of stockholders and speculators.

The discussion was closed with an allusion by the President of the Institute, who is also the Chief Engineer of the Gas Works, to some of the important regulations, originating here, for the security of gas consumers against the dangers and annoyances portrayed in the remonstrance. These have proved to be so well adapted to their purpose, that, after trial for nearly a quarter of a century, no reason has been discovered for making any material change in them.

Mr. A. C. Jones exhibited an apparatus (invented by himself and to be patented,) for weighing coal directly from the common coal cart. It is designed to supply a cheap method of weighing coal, or similar material, at the place of delivery. It consists of a scale arranged on a light frame, easily adjusted on curved bearings fastened to the top rods of the cart. This frame cannot be displaced by jolting, yet it may be slid up to the front of the cart, out of the way, when it is being filled.

Under the body of the cart a box is suspended by chains and hooks attached to a rod, passing across the cart, operated by a lever which in certain positions holds the box up firmly to the cart, so as to be carried safely over the roughest roads; puts it in place to be filled without injury to the scale bearings, or transfers the load to the scales to be weighed by a fixed small weight, representing a quarter of a "short ton," which may be changed to the "long ton," by placing a ring on the weight; the box is so suspended from the scale levers that it can be easily "tilted" with one hand, whilst the other relieves the hinged front of the box, and the load shoots out on the ground. By using a "prop" more than a quarter of a ton can be weighed at one time; but a quarter of a ton is believed to be the best size, as the few minutes extra required will more than be compensated for by rest to the horse, and also the whole apparatus may be so light as to be no drawback to its being carried with the load. When not required for weighing, the box and scale frame may be removed from the cart, to be replaced when wanted.

This scale will weigh correctly when one wheel of the cart is ten inches higher than the other, or if both wheels are in a deep gutter, thus giving the greater inclination to the cart.

Abstract of Meteorological Observations for November, 1858; *made in Philadelphia, Somerset, and Huntingdon Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.*

November, 1858.	PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.									SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.								HUNTINGDON, Huntingdon County. JACOB MILLER, Observer.					
	Barometer.		Thermometer.			Relative humidity.	Force of vapor.	Rain.	Pre-vail'g winds.	Barometer.		Ther.		Relative humidity.	Force of vapor.	Rain and Snow.	Pre-vail'g winds	Barometer.		Ther.		Rain and Snow.	Pre-vail'g winds
	Mean.	Mean daily range.	Mean.	Daily oscillation	Mean daily range.	2 P. M.	2 P.M.			Mean.	Mean daily range.	Mean.	Mean daily range.	2 P. M.	2 P.M.			Mean.	Mean daily range.	Mean	Mean daily range.		
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	Direc.	Inch.	Inch.	°	°	Per ct.	Inch.	Inch.	Direc.	Inch.	Inch.	°	°	Inch.	Direc.
1	30·037	·191	58·0	18	4·3	45	·286		(var.)	27·830	·132	46·7	2·3	58	·281		S E.	29·500	·120	48·7	3·0		E.
2	30·011	·044	54·7	10	3·3	75	·350		N E.	27·681	·149	47·7	9·0	92	·311	0·332	E.	29·413	·087	51·3	6·7	0·354	E.
3	29·926	·086	50·2	10	4·5	90	·348	1·067	S E.	27·660	·036	46·3	2·0	92	·323		E.	29·395	·019	47·3	4·0	0·432	E.
4	29·806	·119	49·5	5	1·7	93	·348	0·051	(var.)	27·650	·013	45·7	3·3	80	·321		W.	29·312	·083	47·7	3·0		N E.
● 5	29·819	·060	49·7	7	1·5	73	·282	} 1·341	N E.	27·568	·086	44·0	2·3	92	·298	} 1·274	E.	29·260	·057	47·3	3·0	0·226	N E.
6	29·517	·302	49·0	9	2·3	93	·361		N E.	27·371	·197	42·0	2·0	55	·178		W.	29·038	·222	42·3	6·3	1·036	W.
7	29·685	·168	48·2	19	5·5	49	·222		WSW.	27·450	·079	38·0	4·0	62	170		W.	29·102	·064	43·3	3·0		W.
8	29·670	·035	50·5	19	2·3	42	·202		S W.	27·470	·021	41·0	5·7	59	·220		S W.	29·130	·037	43·7	5·7		W.
9	29·677	·020	46·8	23	3·7	65	·233	0·007	N W.	27·497	·027	38·0	4·3	83	·221	0·063	W.	29·157	·031	43·3	4·3		N.
10	29·814	·137	46·3	15	1·2	46	·172		WNW	27·603	·106	35·7	2·3	90	·207		W.	29·301	·145	40·7	2·7		N.
11	29·916	·103	43·3	11	3·0	46	·153		N E.	27·670	·068	35·3	2·3	72	·165		S S E.	29·361	·089	40·0	2·0		N.
12	29·901	·041	39·5	12¼	3·8	45	·129		N W.	27·617	·053	35·7	1·7	57	·146		S W.	29·295	·067	40·3	2·3	0·025	N.
☽ 13	29·661	·240	44·8	14½	5·3	78	·283	0·044	S W.	27·430	·184	33·3	5·0	90	·199	0·196	(var.)	29·085	·209	42·0	3·7	0·098	(var.)
14	29·957	·295	34·7	17	10·2	38	·090		WNW	27·677	·247	30·3	3·7	63	·144		W.	29·385	·299	32·0	10·0		N W.
15	29·828	·129	35·2	4	3·5	90	·191	0·200	S W.	27·579	·098	28·0	3·0	100	167	0·140	N W.	29·277	·107	32·0	1·3	(S.)	N.
16	29·781	·058	33·3	16	4·5	45	·103		N W.	27·598	·036	27·3	2·0	66	·120		W.	29·280	032	30·0	4·0		W.
17	29·873	·092	38·7	13	5·3	33	·102		WSW	27·727	·129	26·7	0·7	95	·160		W.	29·403	·122	35·7	5·7		N W.
18	29·864	·043	40·2	16	1·5	34	·111		WNW	27·676	·054	30·7	4·0	69	·142		W.	29·362	·040	35·0	2·7		W.
19	29·891	·028	36·7	10	4·5	49	·125		N W.	27·712	·036	27·3	4·0	94	·148		W.	29·414	·060	33·3	5·7		W.
○ 20	29·891	·083	37·0	18	4·3	48	·140		S W.	27·595	·123	26·0	6·0	66	·120		(var.)	29·285	·129	30·7	8·7		N W.
21	29·695	·196	40·2	6⅓	6·8	91	·212	0·480	N.	27·427	·164	33·3	7·3	85	·176	0·086	W.	29·124	·160	36·7	6·0	(S.)	S.
22	29·776	·081	40·8	11	4·0	64	·193	} 1·515	N E.	27·443	·079	31·0	2·3	74	·149	0·476	E S E.	29·182	·115	37·3	1·3	0·387	E.
23	29·527	·249	41·7	7	2·2	75	·208		WNW	27·284	·159	34·0	3·0	84	·169	0·092	W.	28·963	·218	37·0	1·0	(S.)	W.
24	29·625	·098	40·3	9	1·3	67	·186		W.	27·388	·104	30·7	3·3	100	·196	0·071	W.	29·075	·112	37·3	1·0		N W.
25	29·781	·156	37·7	10	2·7	49	·125		WNW	27·645	·257	29·7	1·0	100	·181		W.	29·319	·244	36·3	1·0		N W.
26	29·903	·122	36·7	13	1·7	42	·112		WNW	27·772	·127	28·3	2·0	78	·147		W.	29·483	·164	35·3	1·0		W.
☾ 27	30·024	·121	38·3	12	1·7	42	·112		N W.	27·732	·109	29·3	1·7	89	·175	0·453	WNW	29·441	·110	35·3	2·0	(S.)	N W.
28	29·590	·435	34·7	9½	3·7	95	·201	0·469	N E.	27·236	·496	36·3	7·0	90	·199	0·731	W.	28·950	·492	34·0	1·3	0·390	N W.
29	29·647	·195	33·0	7½	1·7	80	·162	0·051	N E.	27·351	·163	34·3	4·0	73	·181		W.	29·066	·170	35·0	1·0	0·018	N W.
30	29·826	·142	37·0	15½	4·0	43	·120		(var.)	27·626	·275	28·0	6·3	74	·149		W.	29·311	·245	33·3	3·0		W.
Means	29·797	·136	42·2	12¼	3·5	61	·195	5·225	N 41 W.	27·565	·127	34·7	3·6	79	·192	3·914		29·256	·135	38·8	3·6	2·966	

JOURNAL

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OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

MARCH, 1859.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Papers on Bridge Construction. By JOHN W. MURPHY, Civ. Eng. Philadelphia, Pennsylvania.

In beginning a series of papers on the theory and practice of bridge construction, it would seem most appropriate that the *arch* should first receive attention.

Among the ancient Romans, (who were essentially the first bridge builders,) the arch was made the primary feature of all their engineering and architectural constructions where the support of weights over spaces became necessary, and it has, indeed, ever since, been a favorite of the most distinguished engineers of every age, from the period of which I speak, to the present day.

I therefore propose to discuss the theory and practice of the construction of arch bridges when built in stone, iron, and wood.

The principles which govern the stability of the arch, are discovered by the investigation of two general problems.

1st, To find what weights will maintain the arch in equilibrium, when the line of pressures run parallel to the intrado.

Let A, K, M, Fig. 1, represent an arch which we may assume without error, to consist of the straight lines, M N, N O, O P, &c. And suppose that these lines are freely movable about the joints, M, N, O, . . K.

It is required to find what weights shall be placed on each joint, (a weight on any one joint being known or assumed,) so that the arch

shall be in equilibrium, and the joints, N, O, P, . . . K, remain in position at rest.

Represent these weights by N', O', P', . . . K', as they shall respectively act at the points, N, O, P, . . . K.

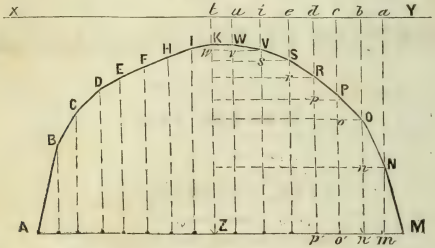
Draw the lines, N m, O n, . . . K w, in the direction of gravity, and the horizontal lines, m M, N n, O o, &c.

Now the pressure of all the superincumbent weights at and above N, will be conveyed to M, through the line N M.

And all above the joint O to the joint N, through the line O N.

Now the weight at N, acting in the direction of gravity, through the line N m, has its horizontal thrust at M $= m$ M, and the weight at O, in the same manner its horizontal component n N.

Fig. 1.



Now that the points, N, O, P, . . . K, shall remain in equilibrium depends upon the condition, that the weight of the superincumbent mass, acting at N, shall produce a horizontal thrust in the direction m M, equal to the horizontal thrust induced by the weights above O, acting at O; and in the same manner, the weights acting at P, shall produce a horizontal thrust in the direction o O, equal to that at m M; and equal to that at n N.

And per consequence that all the weights, N', O', P' . . . K', shall have such values, that the horizontal thrust shall be equal at each joint of the arch.

Now, by construction, we have given to the lines m M, n N, . . N m, O n, &c., values, for they are geometrical conditions of the arch. Hence, to form a general equation.

Represent any vertical line such as N m, O n, P o, &c., by a. Any horizontal line such as m M, n N, by b; and represent the horizontal thrust, (which, by condition of equilibrium, must be constant for every joint of the arch,) by h.

Then we shall have,

$$(K'+W'+V' \;.\;.\;.\; +N') : h :: a : b, \text{ or}$$

$$(1.)\; N' = \frac{a\,h}{b} - (K' - W' - V' - \quad\;);$$

which may be interpreted thus:—

The weight at any joint of the arch, as at K, W, O, . . N, *in order that equilibrium may be maintained, is equal to the length of the vertical line drawn from that joint to the intersection of the horizontal line drawn from the joint next below it. Multiplied into the horizontal thrust (which may be assumed at pleasure, but which must be constant for every joint).*

Divided by the horizontal distance of the next joint below intercepted by the vertical—minus the sum of all the weights applied above the point assumed.

It will be observed that the lines N M, N O, O P, &c., are the resultants of the *vertical weights* and *horizontal thrust* for each joint—and hence, the line of pressure of whatsoever material the arch may be constructed, will be parallel to the lines N M, N O, &c.

THE SECOND PROBLEM to be solved is to find the direction of the lines of pressure. When the weights above the points K, W, V, . . N, are known, the condition depending upon the horizontal thrust$=h$, being constant and the same for each joint.

Draw the line X, Y, and project the verticals to it—as at t, u, i, &c., represent by the distances t, K, u, W, . . a, N. The weight severally placed over the joints K, W, . . N, and let these weights finally as in equation (1) be represented by K′, W′, V′ . . . N′.

We will find from equation (1) a new line of *resultant pressures*, obeying the same law—as the fixed line M N, N O, . . W K. To describe this line divide for convenience the half span of the arch Z M, into any number of equal parts, this will make the value of b in equation (1) constant, and the same for every point N, O, P, &c., a and b, being the co-ordinates for the points N, O, P, &c., giving value to b, we find from equation (1)

$$(2.)\ a=\frac{(K'+W'+V'\ .\ .\ .\ +N')}{h}\,b=m,\ N.$$

and in the same manner the value of a, may be found for any given joints as at O P. . . . K.

The constant value of h, in this last problem, must be determined from the weight K′, at the crown. This will be explained when we come to the practical part of our subject.

We have thus obtained two formulæ, the one expressing the ratio between weights or masses which shall be placed upon a given curve (or system of lines approximating to a curve), so that the curve may be maintained in equilibrium.

The other providing the co-ordinates (so to express it), which will describe a curve (or system of lines approximating to it), where the weights placed upon it may have any value.

I therefore propose to depend for principles in the construction of arches upon the two equations (1) and (2), knowing that they fulfil all the requirements of the practical Engineer, for whose benefit I am attempting to write.

(To be Continued.)

For the Journal of the Franklin Institute.

Solutions of some Topographical Problems, by "One Plane Descriptive Geometry." By John M. Richardson, B. S.

Topographical Problems.

Hills are most correctly represented by cutting them with a system of horizontal planes, and finding the projections of the curves of intersections. These curves are numbered, beginning at the lowest, or each one is marked by a number denoting its height above the lowest or datum plane.

The distance between the secant planes is dependent upon the accuracy with which it is necessary to delineate the surface. With any given distance between the secant planes, it is evident that the projections of the curves of intersection will be nearer together as the surface of the hill is steeper, and farther apart as the surface approaches nearer to horizontality.

The lines of intersection are called "contour lines," or "lines of horizontal section." The methods of determining these lines in the field and of plotting them, belong to Surveying, and cannot be explained here.

Problem I. Fig 1.—To find the intersection of a given plane with a given hill.

Let (a, 0)—(b, 8) be the plane, and (c, 0)—(d, 1)—(e, 2)—(l, 8) the surface.

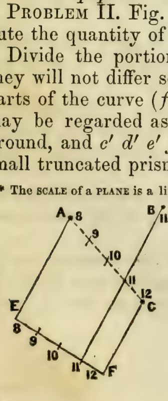
Through each point of division of the scale* of the plane draw a horizontal line in the plane, and find the points in which it intersects the curve of the surface which lies in the same horizontal plane.

The horizontal line through (m, 4) intersects (g, 4) in two points which are projected in r and r'. In the same manner other points of intersection are determined, and the curve is $n\ p\ q\ s\ r\ t\ u\ v\ w\ x\ w'\ v'\ u'\ t'\ r'\ s'\ q'\ p'\ n'$.

Problem II. Fig. 1.—The given surface being that of a hill, to compute the quantity of earth cut off by the plane and lying above it.

Divide the portion $q\ q'$ of the curve (e, 2) into parts so small that they will not differ sensibly from their chords, and take corresponding parts of the curve (f, 3). The trapezium whose projection is $c'\ d'\ e'\ f'$ may be regarded as coinciding very nearly with the surface of the ground, and $c'\ d'\ e'\ f'$ may be regarded as being the right-section of a small truncated prism whose lower base is in the horizontal plane, and

* The scale of a plane is a line divided into parts equal to the horizontal interval between the contour lines of that plane. The contour lines of a plane are of course all straight lines, and their horizontal intervals equal, since the inclination of a plane is the same in all parts.



The scale of a plane may be thus constructed. Let A, B, C, be three points in a plane, their heights above the datum being marked.

Draw A, C, connecting the lowest and highest points—divide in a number of equal parts equal to the difference of height between A and C. Through the point corresponding to the elevation of B draw B 11 and produce it—draw a line E, F, at right angles to B 11. The line E, F., divided as in the cut, and produced if necessary, is called the scale of the plane. It is nothing more than the line of greatest inclination of the plane crossing the contour lines at right angles and divided by them into equal parts.

We must bear in mind that only a plane can have a scale—that an irregular surface cannot.

whose upper base lies in the surface. That portion of this prism which lies above the cutting plane is required. It is evidently equal to the area $c'\ d'\ e'\ f'$ multiplied by the mean height of the four points $(c', d'\ 2)$, $(e', f', 3)$ above the cutting plane.

Knowing the scale according to which the diagram is drawn, it is easy to calculate the area of $c'\ d'\ e'\ f'$, and having the scale of the plane, the height of each of the points $(a', d', 2)$, $(e', f', 3)$ above it, can be readily found. From c' draw $c'\ c''$ perpendicular to the trace* of the plane, and if $\frac{m}{n}$ is the scale of the plane, $\frac{m}{n}\times c'\ c''$ is the height of the point in which the perpendicular through $(c', 2)$ pierces the cutting plane. Hence

$$2-\frac{m}{n}\times c'\ c''=\frac{2\,n-m\times c'\ c''}{n},$$ is the height of $(c', 2)$ above the plane.

Finding the height of each of the other points above the plane in the same manner, there results for there mean height above it,

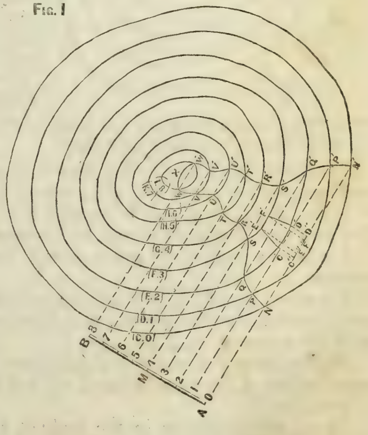
$$\frac{10\ n-m\ (c'\ c''+d'\ d''+e'\ e''+f'\ f'')}{4\ n},$$

and for the volume of the truncated prism above the plane,

$$c'\ d'\ e'\ f'\times\frac{10\ n-m\,(c'\ c''+d'\ d''+e'\ e''+f'\ f'')}{4\ n}.$$

Finding in the same manner that part of each of the elementary truncated prisms which lies above the cutting plane and adding them all together, their sum will be volume cut off by the plane.

Fig. 1



Of course this is only an approximate solution, and is more or less correct according as the horizontal planes which determine the scale of the cutting plane and the horizontal contour lines of the surface, are nearer together or farther apart, and as the chords of the elementary curves correspond more or less nearly with them.

If the curves are very near in space, the chords of the elementary portions of their projections may be regarded as parallel, and $c'\ d'\ e'\ f'$ will then become a trapezoid.

Problem III. Fig. 2.—To draw a plane through a given line tan-

* The trace of a plane is its intersection with the plane of projection, and is of course a straight line lying in the plane of projection.

gent to a given hill, the plane to lie entirely above the surface of the hill.

Let $(a, 0)$—$(b, 6)$ be the line, and $(c, 0)$—$(d, 1)$—$(k, 6)$ the given surface.

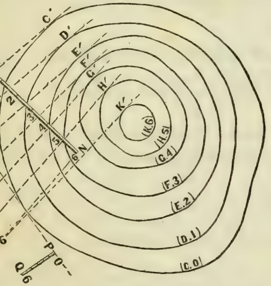
Through each point of division of the line draw horizontal lines tangent to the horizontal sections of the surface; $a\ e'$, $1\ d'$, $2\ e'$ and $c.$, are their projections.

Then, the plane which passes through the given line, and that horizontal line whose projection makes the least angle with $a\ b$, (the angle being estimated from the projection towards the direction in which the line descends), is the required tangent plane, $a\ 5\ h'$ being the least angle, $5\ h'$ is the projection of a line of the required plane, and its scale will be perpendicular to $5\ h'$.

Drawing through a, 1, 2, 3, &c-, lines parallel to $5\ h'$, $(m, 0)$—$(n, 6)$ is the scale of the required plane.

It is evident that $(m, 0)$—$(n, 6)$ is a tangent plane; for if through m, 1, 2, &c., lines be drawn perpendicular to $m\ n$, none of them will cut the horizontal sections of the given surface, and one of them, $5\ h'$, is tangent to the section of the surface which lies in the same horizontal plane.

FIG. 2



It is also evident, that if planes be passed through the given line and the other horizontal lines which were drawn tangent to the horizontal sections of the surface, that they will all cut the surface. From a given point in the plane of a curve two tangents can generally be drawn to the curve; it follows, then, from the construction, that two planes can be drawn through the given line tangent to the given surface. $(p, 0)$—$(q, 6)$ is the scale of the other plane.

PROBLEM IV. Fig. 3.—To draw a plane parallel to a given plane and tangent to a given hill, the plane to lie entirely above the hill.

Since the planes are to be parallel their scales will be parallel, and the intervals of graduation will be the same.

Let $(a, 0)$—$(b, 6)$ be the plane, and $(c, 0)$—$(d, 1)$—$(e, 2)$—$(k, 6)$, the surface.

Draw $l\ m$ parallel to $a\ b$, and tangent to the projections of the horizontal sections of the surface, draw lines perpendicular to $l\ m$, meeting it in the points m, p, q, &c.

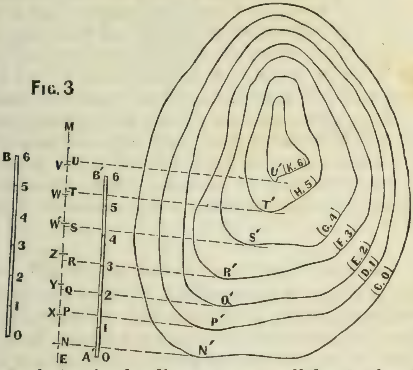
Beginning at the lowest of these points, lay off towards m distances equal to one of the equal parts of $a\ b$, and let x, y, z, &c., be the points of division.

These points will be in the scale of a plane drawn through $n\ n'$ parallel to the given plane, and will be at the heights 1, 2, 3, 4, &c., respectively.

But since this plane in rising from l to m, has a height (2) at the point y, it must pass below q, and therefore below $q\,q'$, and must cut the curve (e, 2), in some point. Hence it cannot be the required plane.

Commencing at p, lay off in like manner divisions equal to those of $a\,b$, and repeat the construction with respect to each of the points n, p, q, &c., until one is found from which the divisions being laid off all the points lie nearer to l than the corresponding points n, p, q, &c., at the same elevation. These will be the required points of graduation of the scale of the required plane. In the diagram, r is the point from which the divisions must be laid off.

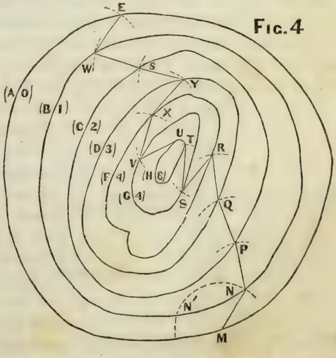
FIG. 3



To avoid confusion in the diagram, a parallel to $l\,m$ has been drawn, and the scale is constructed on it. r' is the point of contact, and (a', 0)—b', 6 is the tangent plane.

PROBLEM V. Fig. 4.—To ascend a given hill with a given slope.

FIG. 4



Let (a, 0)—(h, 6) be the hill, and $\frac{m}{n}$ the given slope. The secant planes being at the unit's distance apart, $1 \div \frac{m}{n} = \frac{n}{m}$ will be the length of the projection of that portion of the required line which joins any two adjacent contour lines, m being the point at which the ascent is to begin, with m as a centre, a radius equal to $\frac{n}{m}$ describe the arc of a circle cutting (b, 1) in m; in the same manner with n as a centre find p; then q, r, s, t, and $m\,n\,p\,q\,r\,s\,t$ will

be the projection of the required line. If it is required to descend the hill so as to reach the bottom at a point as nearly opposite to m as possible, trace $(h, 6)$ to u, and with u as a centre and the same radius as before describe an arc cutting $(g, 5)$ in v; then find x, y, z, w, e, and $u\ v\ x\ y\ z\ w\ e$ will be the projection of the line of descent.

If the slope of descent should differ from that of ascent, the radius will be found by dividing 1 by the slope. The contour lines are supposed to be so near to each other that the surface between them may be generated by the motion of a right line resting upon both and remaining constantly perpendicular to one, or making equal angles with them both. The arc described from m as a centre, and a radius equal to $m\ n$ cuts $(b, 1)$ in two places, m' and n, and there may be two lines joining $(a, 0)$ and $(b, 1)$ which will fulfil the given condition. In the same manner it can be shown, that having found n' and n, four lines may join them with the next curve, all of which will fulfil the given condition. Hence quite a number of lines, all beginning at m, may be drawn which will fulfil the required condition. Although these lines all begin at the same point, they will not end at the same. In a case of practice, then, these lines, or several of them, should be examined in detail, and that one selected which actual examination proves to be best.

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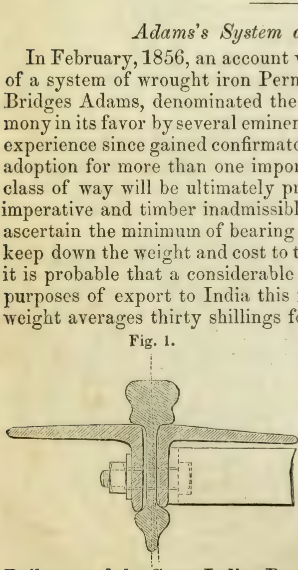
*Adams's System of Permanent Way.**

In February, 1856, an account was given in the pages of this *Journal* of a system of wrought iron Permanent Way for Railways, by Mr. W. Bridges Adams, denominated the Suspended Girder Rail. The testimony in its favor by several eminent railway engineers, and the practical experience since gained confirmatory of their opinions, together with its adoption for more than one important line, make it probable that this class of way will be ultimately preferred, wherever iron is considered imperative and timber inadmissible. Experiments are still going on to ascertain the minimum of bearing surface which will suffice, in order to keep down the weight and cost to the absolutely requisite quantity, and it is probable that a considerable reduction will be the result. For the purposes of export to India this is of great importance, as every ton weight averages thirty shillings for freight—about one-sixth added to the original cost of the materials. And wrought iron is in all structures a very considerable reduction of dead weight, with equal strength and greater security as compared with cast iron. The two sections hitherto applied are as follows:—Single-headed (Fig. 1) and Double-headed (Fig. 2).

Fig. 1.

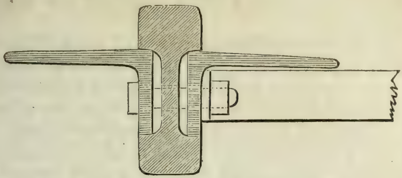


Meanwhile two of the highest Indian authorities—the East Indian Railway and the Great Indian Peninsular Railway—appear to consider

* From the Journal of the Society of Arts, No. 312.

the question of iron sleepers a most important point, judging from their half-yearly reports. The East Indian engineer states that the cast iron sleepers are a comparative failure, and that they are being removed into branch roads and sidings, and being replaced on the main line with timber sleepers. The Great Indian Peninsular engineer, on the

Fig. 2.



contrary, states that the destruction of timber sleepers is ten per cent. compared with five per cent. of the cast iron sleepers. In the absence of specific information as to the cause of failure, it is to be presumed that the failure of the cast iron is from breakage—a defect from which the wrought iron system is free—and the failure of the timber must be either from the white ant or from splitting by moisture and heat.

Structure has, no doubt, much to do with it, both in the case of iron and timber. A bad form of cast iron will ensure breakage even with a surplus amount of weight, and the mode in which timber sleepers are commonly used with double-headed rails, both in England and India, is not favorable either to the durability of the rails or timber.

The timber sleepers are usually ten inches in width, five inches in depth, and from nine to ten feet long. At each end of the sleepers is fixed down, by iron spikes or wood trenails, a mass of cast iron called a chair, now usually varying from 25 lbs. to $42\frac{1}{2}$ lbs. each. In these chairs, the distance of which apart on the sleeper determines the gauge, are fixed the rails, the opening being sufficient to drop them in from above, and they are secured by wooden keys driven in laterally outside. The rail is composed of three members or portions, the lower table, the upper table, and the vertical web, which connects them together. The rail resting in the chair on its lower table acts as a prop to sustain the wheels. If the rails and chairs are always in contact, no blow will ensue, and when the upper table is worn out by work, it may be turned down, and the lower table will supply an unworn surface, with only the defect of a bad bearing in the chair, by reason of the worn surface of what was the upper table. But, practically, the running of the wheels causes lateral blows which crush the wooden keys, and the rails get loose in the chairs, striking a succession of hard blows well-known to passengers, crystallizing the texture of the rails, and destroying their upper surface by the blows of the wheels and their lower surface by blows on the chairs. All this is aggravated by the great elevation of the rails above the bearing of the sleepers on the ballast. The rail is five inches, the chair two inches, and the sleeper five inches, total twelve inches; thus any loosening of the wood key is aggravated by the height

of the prop, and a rocking motion ensues which disturbs the bearing of the sleepers, and in wet weather, lets in the water beneath them. To solidify the sleepers below, it is thus needful to dig out 12 inches of material to get at them, and this leaves loose ballast above when again filled in, which is disadvantageous in many ways. In this particular the wrought iron suspended girder is particularly advantageous. It is not requisite to open up the ground to get at it, and the upper surface is always firm and solid.

The principle of the wrought iron way, *i. e.*, suspending the rail from the upper table instead of propping it on the lower table, has, for a considerable time past, been applied to timber as well as to iron, and for those who think timber sleepers better than iron, the advantages, mechanical and economical, hereby attained, are very great. In the first place, as the rail is suspended by the upper table, it does not need one half the strength of the vertical web, but merely enough to hold the top and bottom tables together, as in an ordinary bridge girder. Consequently, weight can be saved in the rails, and at the same time their depth can be increased. An ordinary rail is five inches in depth, and as the strength of a beam is as the square of its depth 5×5 represent 25, whereas 6×6 represent 36, or one-half increase, and 7×7 represent 49, or nearly double.

In the side channels of these deep rails are bolted lateral timbers, four inches wide by four inches deep, by key bolts, three feet apart, making a total width of eleven inches. The rail is thus compounded of a central iron bar between two timber bars, which give it great lateral strength in addition to its own increased vertical strength.

The lower rails are connected together at the joints by brackets of wrought angle iron, bolted down to a cross-sleeper. If the rails are long, a central cross timber, four inches by four inches, is secured to the central key-bolts, and thus the gauge is secured.

In the ordinary cross-sleeper road there is a sleeper every yard, the full area of which is about seven and a half superficial feet, but the practical bearing is generally calculated at less than three-fourths. On the longitudinal plan the whole area may be reckoned, and therefore the area of the suspended plan is fully equal to that of the cross-sleeper plan, while the height of the rail is only four inches above the bearing, instead of twelve inches on the ordinary method.

When this plan was first proposed it was imagined that the small bearing surface of the rail on the timber by which it was suspended would crush in and destroy the timber; but calculation easily demonstrates the contrary. For instance, there are six chairs to an 18 feet rail; the bearing of each chair on the timber sleepers is about 48 square inches—total, 288. In the suspended method there is a width of three-quarters of an inch along each side of the rail, amounting to a total of 320 square inches,—and continuous.

But, it was argued, on the Great Western system of the bridge rail there are 1080 square inches in the same length, and yet it crushes into the timber. Quite true, but the reason is obvious. It is a shallow and not a deep rail, and it does not distribute its load over a long space

as does the deep rail. It crushes the timber in detail beneath the wheels.

The engineer of the North London Railway had faith in the system, and determined to lay down a few lengths on trial. The total width of the combined rail and lateral timbers was ten inches and a half, and the rails used were not deep, but the ordinary section of five inches—the total depth of the timbers being four inches. The rails were connected at the joints by cast iron angle brackets secured to cross-sleepers, and there was no intermediate tie, the length of rail being only fifteen feet. The result is given in the following report by the engineer :—

" The experimental length of the suspended rail laid on the North London Railway has now been down about twelve months. It was purposely placed in a situation exposed to the severest test which the line admits of, at the foot of a steep gradient, on a sharp curve, and at a station where numerous trains stop and pass through every hour.

" From the weekly reports furnished by the Company's inspectors, combined with my own occasional examination, I am able to state, with confidence, that the result of this trial has been very satisfactory in respect of durability and of economy. The original outlay is less than that required for the ordinary modes of construction, and the cost of manufacture is trifling, while the road is smooth and easy for the traffic."

On the North London Railway engines are used of thirty-five tons weight. Passenger trains are incessant, goods trains frequent, and with the exception that the speeds are not quite so great as on some other lines, it is one of the hardest worked lines in the world, and the use of brakes is very destructive. On the sample piece of line, the upper table of the rails being actually worn out, they were reversed, when the lower table was found as perfect as when new, and the timber was absolutely free from any wear or movement in those parts where the rail bore on it. When the bolts were taken out the timber remained fast in the recesses of the side channels, and it required force to get it out. It had become, as it were, cemented to the iron.

Since then, a portion has been laid down on the Eastern Counties line—the main line from Cambridge, near the locomotive sheds—where it has been examined by several engineers, and highly approved of. The movement is easier and smoother than on any other part of the line, though only the ordinary rails and not improved rails have been used, and the common sleepers cut down the middle have been used, instead of proper longitudinals.

We come, now, to the question of cost and comparison.

CROSS SLEEPER LINE.

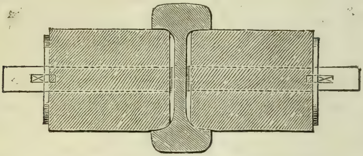
Quantities in a single mile.

		Tons.	Cwt.		£	s.	£	s.	d.
504 Rails, 21 feet long	70 lbs. per yard, 5 in. deep	110	0	at say	8	0	880	0	0
504 pairs Fishes	22 lbs. per pair	4	19	"	9	0	44	11	0
2016 Bolts		1	2	"	20	0	22	0	0
3520 Cast Chairs	28 lbs. each	44	0	"	5	0	220	0	0
7040 Spikes	1 lb. each	3	3	"	12	0	37	16	0
3520 Wood Keys				"	5	0	18	0	0
1760 Cross Sleepers creosoted	5 in.×10 in.×9ft, 4s. 6d. each	130	0	"			396	0	0
18864 Parts.		293	4				1618	7	0
	Freight to India at 30s. per ton,						439	10	0
							£2057	17	0

SUSPENDED RAIL ON TIMBER LONGITUDINALS.

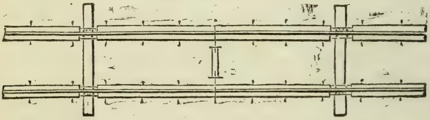
		Tons. Cwt.		£ s.	£ s. d.
504 Rails, 21 feet long	65 lbs. per yard, 6 in. deep	102 3	at say	8 0	817 4 0
504 pairs Angle Joints, 1 ft. 6 in. long	28 lbs. per pair	6 6	"	9 0	56 14 0
1008 Bolts for Angle Joints	1½ lbs. each	0 13½	"	20 0	13 10 0
3520 Key bolts for timber	2½ lbs. each	4 0	"	12 0	48 0 0
1008 Angle Joint Spikes	1 lb. each	0 9	"	12 0	5 8 0
1008 Timber Longitudinals	5 in.×4 in.×19 ft 6 in. 56 loads	42 0	"	3 10	Load 196 0 0
252 Cross Sleepers	5 in.×5 in.×9 ft., 4s. 6d. each	19 0	"	3 10	do. 56 14 0
252 Wood Ties	4 in.×4 in.×4 ft., 2 loads	1 12			7 0 0
8056 Parts		176 3½			1200 10 0
	Freight to India at 30 s. per ton,				264 5 3
					£1464 15 3

Fig. 3.



The cross section and plan of the suspended rail are here given. It will be seen that to remove the rail it is not necessary to remove the timber, but only the joint bolts, both sides being alike. Fig. 3 is the cross section, Fig. 4 the plan.

Fig. 4.



Assuming these prices to be correct, the saving on first cost by the improved system in England is per single mile,	£417 17 0
In India, taking the difference in freight; there is a saving of	175 4 6
Total saving,	£593 1 6

With a rail of one-half more vertical strength.*

If the same principle of side bolting be adopted with cast iron sleepers in the strongest mechanical section, as Fig. 5, the cost per mile will be—

	Tons. Cwt.			£ s. d.
504 Rails	102 3	at	£8	817 4 0
3520 Pairs cast Side Brackets	100 0	"	5	500 0 0
4024 Key Bolts .3 lbs. each	5 8	"	12	64 16 0
504 Tie Bars, 12 lbs. each	2 14	"	12	32 8 0
	210 5			1414 8 0
Freight to India 30 s. per ton				315 7 6
				£1729 15 6

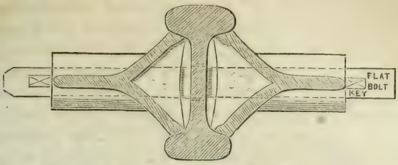
A sample of this has been applied on the South-Western Railway.

The saving in this mode as compared with the common system will be £326 0s. 0d. Cast iron can of course only be used in short lengths, and not continuously like wrought iron. The minimum ultimate cost of the wrought iron way is not yet ascertained, the reduction in scantling being still in course of experiment, but enough has been shown to

* The timber longitudinals may be applied in shorter lengths, break-joint if preferred.

induce those interested to institute a very searching inquiry into the whole matter.

Fig. 5.



In using the small scantling of timber, two obvious advantages arise,—lower cost of material, and greater facility for creosoting, if that process be applied. It will bring a simpler and cheaper class of timber into use for railway sleepers. This system is really lower in cost than the American system, which has been adopted from the temporary ways of English contractors, but with the advantages of a double-headed rail of less comparative weight, but really equivalent to two rails, the lower side remaining undamaged while the upper side is wearing out. And in addition to this there is a great saving in the depth of ballast.

The prominent distinction between the American system and the English system, is, that in England a double-headed rail is used, secured in a cast iron chair. The cost of these cast iron chairs, and their freight and transit rendered it necessary to dispense with them for poor lines, and in the absence of other knowledge, the double-headed rail was also dispensed with, and the flat bottomed rail of only half the service substituted for it. This new system of side bearers in the channels practically doubles the duration of the rails while diminishing the cost.

In considering the question of freight as an element in all distant Colonial lines when the material is supplied from England, India has been taken as affording the broadest comparison.

Russian Inland Navigation.

We are indebted to the *United States Railroad and Mining Register*, (Edited by Thomas S. Fernon, Esq., of Philadelphia,) for the following abstract from a very interesting account of the various systems of internal navigation, now in actual use in the Empire of Russia—Comprising *Canals*, *Slackwater Navigations, and River Improvements*—actuated or aided (in most cases), *by reservoirs of considerable magnitude.*

This comprehensive description has been derived mainly from official documents in the Russian language, and may (we understand) be fully relied on, *as authentic.*

The extensive and successful use which has been made of *Reservoirs* in that vast empire, not only to feed canals, but *rivers also*, cannot fail to be interesting to our readers, and may tend to remove from the minds of many, the objections which have been urged against the

employment of this grand and simple expedient, in improving the navigation of certain American rivers—or at least, may remove such objections as have been founded upon the idea that "*the Reservoir System of Improving Rivers*" was a new and untried plan.

While the great longitude and development of the Russian navigable systems, can hardly fail to excite surprise in this country, (where they are little known,) we cannot withhold our commendation of the skill and ingenuity evinced by the Russian engineers, not only in their choice of the most suitable materials in the various localities, but also in the admirable adaptation of the plans of their hydraulic works, to suit the circumstances of each case, so far as they can be gathered from the necessarily brief description before us.

This description of the Russian Inland Navigation, is divided into *three* chapters.

1. *On the artificial navigable communications leading towards St. Petersburg.*
2. *The artificial navigable systems* of the West of Russia.
3. The improvements made in the navigation of rivers.

In perusing these, we shall find strong evidence of a highly advanced state of the arts connected with hydraulics, and we may in this connexion, mention long lock chambers with *numerous sets of gates*, and *movable dams* in the rivers, as useful expedients, which in some places in our own country, it may be found advantageous to employ, to a greater extent than has yet been done among us.

I. *Systems of Artificial Navigation leading towards St. Petersburg.*

System of Vishney Volotchock.—The navigation of the Vishney Volotchock system begins at the Volga, thence ascending the Tvertza river it passes by the Vishney Volotchock canal into the Zna,* and continues down the Zna and Msta to lake Tlmen. In order to avoid the necessity of passing through this lake with the boats and the floats, two canals have been constructed, called the canals of Sievers and of Vishera. On leaving these canals the loads enter the Volkhof river and continue their descent to Ladoga lake.

The construction of the Vishney Volotchock canal, between the Tvertza and Msta rivers, was commenced in 1703. The navigation between the Volga and St. Petersburg was first opened in 1710. This navigation encountered at first great difficulties, occasioned not only by the want of water, but also by the defective construction of the sluices and other hydraulic structures.

In 1719 the works of the Vishney Volotchock canal being found to be much decayed, the re-building of them was entrusted to Michael Serdionkoff, a citizen of Novgorod, who at his own expense removed the different hydraulic structures, deepened the canals and rivers, and established reservoirs. As a remuneration for the expense he was thus subjected to, he was allowed various privileges for the establishment of mills and also of drinking shops or taverns for the people engaged in the naviga-

* The name of Zna is given to the upper part of the Msta river as far down as its entrance into the lake Mstino.

tion, and he was permitted to levy a certain toll upon the boats which traversed this system of navigation.

Serdionkoff improved the Vishney Volotchock system; at his death the administration passed to his heirs, who, in 1774, not desiring any longer to continue it, returned the control to the government.

The first improvement undertaken by the government consisted in the establishment of a lock, built of granite, at the exit of the river Msta from the lake Mstino; notwithstanding this improvement, the increase of the trade very soon demonstrated the insufficiency of the artificial resources of this communication.

The principal improvements in the Vishney Volotchock system were made in 1823 and 1826.

They consisted in the enlargement of the reservoir called the *Zavodsk reservoir*, situated in the vicinity of Vishney Volotchock, where a great mass of water is held in reserve, sufficient for all the wants of the most active navigation.

Among the more important improvements of this system must also be reckoned the establishment of elastic floats upon the Msta at the rapids of Borovitchi. These rapids extended for a distance of 20 miles, and in this distance the entire fall is 213 feet.

At the Borovitchi rapids the following difficulties are encountered in the navigation of the river:

A crooked channel between abrupt and stony banks, as well as stony capes or elbows, which project into the stream.

The bed of the river has a rapid inclination, and considerable shoals have been formed in it, which, together, produce violent eddies, and a great agitation of the surface of the water.

The bottom of the channel is uneven and stony, and the direction of the channel is very irregular, passing alternately from one bank to the other.

There are submerged bars covered with long stones brought and left there by the ice during spring floods.

There are bold vertical banks, which become separated from the main land in vertical layers, and threaten to fall into the river. There are islands in the channel of the river, which are not covered in a navigable stage of the water, and which separate the bed of the stream into several branches. With strong side winds, the barks are frequently forced out of the navigable channel into those which are not navigable.

The barks carried away by the force of the current, are often, in spite of all the efforts and skill of the boatmen, driven against the vertical banks and broken. It is for the prevention of such disasters, that the elastic floats have been established in the most dangerous places. The barks which strike against them rebound toward the channel without sinking, so that at present much fewer are lost than there used to be formerly.

At the present time the principal works of the Volotchock system are the following: A canal with a lock, built of granite masonry, between the Tvertza and Zna rivers. This canal is one mile and 4177 feet long and 70 feet broad at the bottom, the depth being about 8 feet.

The canal along the channel of the river Zna with two locks: one *in granite*, at the lower end, and the other *of wood*, built for the purpose of diminishing the consumption of water at the time the boats leave the canal. This canal is 3864 feet long, 70 feet broad, and two feet deep.

The Zavodsk reservoir is used part of the time in feeding the waters of the Tvertza, so that the fleets of barks *may ascend it* from Tver to Vishney Volotchock; afterwards the waters are turned into the lake Mstino and the Msta river *for the descent* of the same fleet of barks toward Novgorod.

The waste weir and flood-gates of Zavodsk reservoir, constitute one of the most important hydraulic works of the whole system. It retains in the reservoir a layer of water 17 feet in depth above the sills of the flood-gates, the superficial area of the reservoir being 14,873 acres.

In place of the old waste weir, the construction of which was rude and defective, and which was much out of order, the present new one has been built, which was finished in 1846.

In the plans for the new waste weir and flood-gates for the Zavodsk reservoir, every precaution has been taken for ensuring the stability of the structure and the resistance of the foundations, for, as has been stated, this is the important hydraulic work of the Vishney Volotchock system. The abutments and piers have been made of *wood*, not only for the purpose of diminishing as much as possible the expense; but most especially for the reason that repairs can only be made after the closing of navigation, that is to say, at the end of autumn, at which time the frosts of winter set in, and render repairs of masonry structures very difficult and uncertain, if indeed it is possible to execute them at all.

The granite lock of the Msta is placed at the head of that river where it leaves the Mstino lake, and where the boats and floats coming from Vishney Volotchock, are united into a fleet. The object of this lock is to retain the water which is drawn from the Zavodsk reservoir in the Mstino lake, as in a new reservoir, the influence of which in raising the waters of the Msta, is much more efficacious than that of the Zavodsk reservoir, on account of its greater proximity.

The Ossvuga reservoir is established near the Ossvuga river, where it empties into the Tvertza, and has a separate waste weir. The object of it is to assist in supplying the Tvertza with water while the fleet of barks is ascending it and to keep the flow of the stream regular.

The construction of a new waste weir was begun in 1842, and finished in 1843, so as to replace the one which previously existed, and which was in a very precarious state.

In selecting the position for the new waste weir of the Ossvuga, care was taken to avoid an inconvenience, which the old one presented, viz: that when the water was permitted to escape through the flood-gates, the current of the Tvertza, already very rapid, would augment considerably in velocity, and thus render the ascent of boats very difficult.

The reservoirs contiguous to the waste weirs of Doubkovka, Kametsk, Bairaizansk, and Ohversk, have been established for the Msta, with the same view as that of the Ossvuga for the Tvertza, that is to say, *to*

complete and regulate the supply of water from the great reservoir of Zavodsk.

The waste weirs of Ouversk and Doubkovka, have been built new, and that of Bairaizansk has been repaired as to its principal parts, in the years 1838, 1839, 1840, 1841.

The system of Vishney Volotchock, *where the navigation is fed by supplies of water artificially controlled*, is 400 miles long, from Tver to the commencement of the canal of the Vychera near the Msta.

For this distance the boats never navigate singly, but are united into fleets or caravans. Four fleets ordinarily pass in each year. About 4000 barks traverse this system annually, passing down the rapids of Borovitche and proceeding towards St. Petersburg. Their cargoes amount to about 514,286 tons gross.*

The vessels which are made use of for transporting cargoes on the Vishney Volotchock system, are principally arks, or flat-boats, 120 feet long and 28 feet wide, and conveying cargoes of from 100 to 130 tons. Their draft of water during the low stage of the rivers is about 21 inches, and in the spring as much as $24\frac{1}{2}$ inches.

These vessels traverse the Vishney Volotchock system with considerably rapidity. The spring fleet, composed ordinarily of 1200 or 1400 arks, carrying from 177,000 to 193,000 tons, is occupied two months in going from Tver to St. Petersburg, a distance, by the water it takes, of about 666 miles.

Two canals, those of Sievers and of Vychera have been constructed for the passage of the arks from the Msta into the Volkhov, without entering lake Tlmen.

The canal of Novgorod, or of *Sievers*, was made for avoiding lake Timen, between the mouth of the Msta river and the commencement of the Volkhov river.

It was begun in 1797 and opened for navigation in 1804.

It is established on the same level with lake Tlmen, and consequently has no locks. It is 5·65 miles in length; its breadth on the bottom is 70 feet; and boats can traverse it with a draft of water equal to 5 feet. The canal begins on the Msta 6 miles from its mouth, and passing through low grounds, which are submerged by the spring floods of the lake, it ends at the outlet of the Volkhov river.

The canal is consequently liable every year to be obstructed with alluvial deposits, which render its navigation difficult in the spring during the prolonged inundations of the Tlmen.

These inconveniences of the Sievers canal, joined with the stoppages to which the arks are liable at the point where they leave the canal to enter the Volkhov, having induced the government to construct between the Msta and the Volkhov another canal now called *the Vychera canal.*

The Vychera canal has therefore also been constructed for the purpose of avoiding the Tlmen lake, and it passes from the Msta to the Vychera, which falls into the Volkhov river.

It was begun in 1826 and opened for navigation in 1836.

It has no locks, but it is closed at the end next the Msta *by a movable*

* In all cases the ton spoken of is the gross ton of 2240 pounds.

dam or waste weir, with granite sluice with abutments and moveable planks, which are put up for a short period in the spring for the purpose of preventing the spring flood, which occurs sooner in the Msta than in the Volkhov, from passing through it. The canal is $9\frac{1}{3}$ miles long and its breadth on the bottom is 38 feet.

The canal commences at the borough of Bronnitzy on the Msta, 16 miles from its mouth, and ends at the Vychera, which falls into one of the branches of the Volkhov, called the little Volkhovets. In consequence of the clayey texture of the soil, the banks of the canal have been revetted.

The breadth of the Vychera canal does not permit the arks to pass each other. In determining the dimensions of the canal, they were made as small as possible for the purpose of diminishing the amount of earthwork, having in view the fact, that by far the greater part of the arks which were to traverse the canal would pass from the Msta towards the Volkhov. But there are also boats, though very few in number, which go from the Volkhov to the Msta, and in order that they may not interfere with the movements of the fleets, *small side basins* have been dug in the bank of the canal, where these boats can stop so as to leave the middle free. Boats can navigate the Vychera canal with a draft of water of 3 feet.

The canals of Sievers and Vychera, have therefore both been constructed for the same purpose, that of avoiding the necessity of entering lake Tlmen with the arks, which thus are enabled to pass from the Msta into the Volkhov and down the latter stream to Ladoga lake.

Ladoga lake is stony and its bottom is covered with large stones; with head winds the navigation is tedious and even dangerous. Moreover the vessels on the lake do not navigate the Vishney Volotchock system, and the arks, which arrive at the Ladoga by the Volkhov, cannot, in consequence of the manner in which they are constructed, continue their navigation upon the lake. For these reasons the Ladoga canal has been built, for the purpose of enabling boats to pass from the Volkhov into the Neva, without entering the lake.

The vessels, which pass through the systems of Vishney Volotchock, Tykvine, and Marie, all pass through the Ladoga canal to reach the Neva, and for this reason the description of this canal should come after those of the three systems.

(To be Continued.)

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*Cornish Engines.**

The number of pumping engines reported this month is 16. They have consumed 982 tons of coal, and lifted 7,400,000 tons of water ten fathoms high. The average duty of the whole is therefore 51,000,000 lbs. lifted one foot high by the consumption of 112 lbs. of coal.—*Lean's Engine Reporter, 23d November.*

* From Herapath's Journal, No. 1017.

AMERICAN PATENTS.

List of American Patents which issued from December 14, 1858, to January 11, 1859, (inclusive,) with Exemplifications.

DECEMBER 14.

50. Stencils; Robert A. Adams, St. Louis, Missouri.

Claim—The preparation of the "stencil" blank, in the manner described, to wit: in oil shellac and glue, applied as set forth; also, the application of the sand or emery to the back of the "stencil," in the manner described.

51. Sewing Machines; J. E. Atwood, Mansfield Centre, Connecticut.

Claim—The combination of the vibrating arm which carries the dog, its attached arm, the swinging frame, the independent levers, the springs, and the cam.

52. Wrist-band Fastener; Daniel S. Baker, Providence, Rhode Island.

Claim—The spring firmly attached to the front of the fastener in its application to the heel, by means of a shoulder and the end, in such manner as to form a perfect fastener, and easily operated upon.

53. Sewing Machines; Amos H. Boyd, Saco, Maine.

Claim—The combination of the looper, the bars, B and C, and cam wheel, when constructed as described.

54. Stoves; John S. Clark, Philadelphia, Pennsylvania.

Claim—The movable plate as it is arranged with, and has relation to, the grate, the usual back plate, the air passages, and the passage for the products of combustion, as set forth.

55. Stoves; John S. Clark and Washington Harris, Philadelphia, Pennsylvania.

Claim—Combining with the adjustable air passages at the top of the interior cylinder or lining, the section of the hollow annulus with perforations, its lower edge resting upon the inner edge of the lining, and its upper edge against the shell plate, and thus forming an air chamber, as set forth.

56. Tea and Coffee Pots; Stephen Culver, Newark, New Jersey.

Claim—1st, The leach, composed of the receptacle, the canister, and the tube or siphon. 2d, The combination of the reservoir with the leach. 3d, The diaphragm with the steam orifice, and the combination thereof with the receptacle of the leach, in the manner described.

57. Excavators; S. S. Curtis, Croton Corners, New York.

Claim—The combination of the eccentric scoop with the adjustable gauge-stops and braces, or their equivalents, arranged in the manner set forth.

58. Railroad Brake; Wm. Edge, Downingtown, Pennsylvania.

Claim—The application to railroad cars of a vertical self-acting safety car brake, consisting of a flanched safety block, cam wheel, axle, lever, chains, connecting rods, bumper, wheel block, pedestal, and shafts, combined as described.

59. Air Engines; John Ericsson, City of New York.

Claim—1st, The system of levers, rock shafts, and connecting rods, or its equivalent, for combining the supply and working pistons with the crank shaft of the engine, to produce the operation specified. 2d, The ring, the notches, check pins, and the elongation of the supply piston, or their equivalents, for effecting the required transfer of the air to and from the heater, and the cooling of the cylinder and preservation of the packing of the working piston. 3d, The telescopic tube applied within the working cylinder and its prolongation, by means of which tube the air is brought in proper contact with the heating surfaces.

[This invention consists in so constructing, arranging, and actuating the supply and working pistons, within a single cylinder, that the cold supply air in being transferred to the heater for the purpose of having its tension augmented, shall cool that portion of the cylinder in which the working piston moves, and keep it at so low a temperature that any kind of metal, or any other suitable material, such as leather, may be employed to keep the piston air-tight. In order to effect this, the working and supply pistons are connected to the crank of the fly-wheel shaft by a system of levers, rock shafts, and connecting rods, of such a nature that an alternating, accelerated, and retarded reciprocating movement will be imparted to the two pistons, capable of effecting the desired transfer of the air and cooling of the working cylinder, and at the same time to produce motive power. The invention further consists in placing the heater within the working cylinder, or a prolongation thereof, and in conveying the supply air from the cold end of the cylinder to the opposite end by such means that every particle of the air to be heated is made to traverse the entire length of the heater.]

60. Car Seats and Couches; G. W. Fairfield, Holyoke, Massachusetts.

Claim—The combination of the flexible backs with the curved grooves and the sliding beam, so that the backs may be brought into a horizontal position.

61. Water Wheels; John H. Fairchild, Jericho, Vermont.

Claim—The single wheel, in combination with the draft tube, said wheel being placed within the penstock, and arranged either horizontally or vertically with said tube. Also, the annular gate placed within the sliding frame in connexion with the adjustable plate, arranged substantially as described.

62. Feed Water and Blow-off Apparatus for Steam Boilers; Jacob Frick, Philadelphia, Pennsylvania.

Claim—Combining an air vessel, having cocks and branches, arranged with the feed and blow-off apparatus, for which Letters Patent of the United States were granted to me on March 18, 1856.

63. Compositions for Tanning Leather; Wm. W. Gaige, Rochester, New York.

Claim—The use of salt and sal-soda in the proportion specified for a preparatory liquor. Also, the combination of starch and catechu in the proportion specified, for the second or first tanning liquor. Also, the combination of starch, catechu, and saltpetre, in the proportion specified, for the third liquor. Also, the combination of starch, catechu, and alum, in the proportion specified, for the fourth liquor.

64. Machine for Making Hollow Bullets; Richard Gornall, Baltimore, Maryland.

Claim—1st, The employment, in combination with a punch and a set of dies, or their equivalents, for pressing blanks or pieces of lead into a form approximating more or less to the desired form for hollow bullets of a revolving core, serving, firstly, to produce the cavities in the bullets, and, secondly, as a mandrel to revolve them, for the purpose of finishing their exteriors by turning them. 2d, The employment, in combination with the revolving core, of a turning cutter operating automatically. 3d, The employment, in combination with the revolving core and turning cutter of a female centre, operating substantially as described, for the purpose of securing the bullets on the core during the turning operation, and liberating them after such operation.

65. Steam and Water Alarm Gauge for Steam Boilers; George W. Grader and Benjamin F. Cowan, Memphis, Tennessee.

Claim—The combined arrangement of the two valves, F I, and their seats, the several chambers and passages, the valve levers and their connexions within the case, A, substantially as described, whereby the construction of the instrument is rendered simple, its form compact, and its size limited without the use of stuffing boxes, or any packing.

66. Machinery for Forming Hat Bodies; Michael Hardy, City of New York.

Claim—Combining a pervious cone, connecting with an exhausting apparatus, a picker or brush of a conical form, substantially as specified. Also, in combination with the pervious cone and conical picker or brush, the apron formed and mounted as described, for supplying fur to the several parts of the length of the picker in proportion to the diameter. Also, in combination with the pervious cone and conical picker or brush, the employment of a series of rollers forming a concave to direct the fur toward the cone. Also, in combination with the two cones, the one on which the bat is formed, and the other fitting over the bat, the tube connected with the exhausting fan and adapted to receive and hold the outer cone, to effect the transfer of the bat of fur fibres from the inner to the outer cone. as set forth.

67. Steam Radiators; John Henry Holt and Josiah H. Gerould, Chicago, Illinois.

Claim—The combination of the wire gauze burner and its vapor hood applied to the self-acting boiler, connected as described, with the steam condensing cylinder and its reservoir, air cocks, and safety and vacuum valves, and its tubes and radiators, M, with their ends open in the apartment to be heated, and governed by the gas regulator; which combination produces a new and improved self-acting and self-regulating apparatus for raising the temperature of any given apartment in which it may be set up by radiation from surfaces heated by condensation of steam generated by the flame of combustible gas.

68. Harness Snaps; B. B. Hotchkiss, Sharon, Connecticut.

Claim—Securing the spring to the snap hook by means of a collar so constructed and applied as to press against the broad end as well as the faces of the spring.

69. Car Brakes; Joseph Hough, Buckingham, and Jacob Moore, Bart, Pennsylvania.

Claim—The arrangement and combination of the slides and levers, as described.

70. Car Springs; Charles R. Hurlburt, Seymour, Connecticut.

Claim—The combination of the two kinds of disks, plane and raised with the rings, when the whole is constructed and arranged substantially as described.

71. Bandages; N. Jensen, Washington City, D. C.

Claim—Forming instruments of two wire springs, a and g, the spring, g, which supports the bag, being hinged and hooked to the other spring, a.

72. Folding Table; Charles Lammrich, City of New York.

Claim—The folding legs, combined with and hinged on to the bed or top of the table, in the manner specified.

73. Sled Brake; Albertus Larrowe, Cohocton, New York.

Claim—The arrangement of lever, scrapers, and rods, operating as described, for the purpose of a self-acting brake, and self-relieving and backing the sled.

74. Engine Hose; Charles Lenzman, Brooklyn, New York.

Claim—The hempen hose woven, saturated, and covered, as described.

75. Folding Chair; R. McG. Lytle, W. G. Alston, and Lorenzo W. True, Williamson Co., Tennessee.

Claim—1st, The arrangement of the arms and also of the back, so that the back retains the arms in place when folded. 2d, The arrangement of the legs so that one set of legs folds over and retains the other set in place. 3d, The combination of the slotted bolt with the socket plate and spring stop, arranged for connecting the arms with the seats. 4th, In combination with the side bars, the screw strap, or its equivalent, for connecting the bars with the legs, so that when folded between the legs, one is raised and the other depressed for the purpose set forth. 5th, Connecting the legs with the seat by means of a socket joint, arranged so that each pair of legs can be withdrawn from their sockets and folded down, without being disconnected from each other or from the seat.

76. Shower Baths; Joseph Mansfield, Jefferson, Wisconsin.

Claim—A shower bath having chambers, tubes, and stop-cocks, substantially as described.

77. Breech-loading Cannon; Edward Marshall, City of New York.

Claim—1st, The employment of the adjustable chucks, constructed in the manner set forth. 2d, The recesses made from the outside of the gun into the bore, for the purpose of containing and concealing the chucks. 3d, The combination of the chucks with the pin, constructed substantially in the manner described. 4th, The arrangement of the pin, the collar, and the screw, substantially in the manner specified. 5th, The employment of projections for the purpose of securing and concealing the handles of the can.

78. Children's Carriage; Gilbert Maynard, Greenfield, Massachusetts.

Claim—Connecting the axle with the tongue by means of the peculiarly formed rods, which also serve as springs for the vehicle, as described.

79. Stair Sweeper; F. H. Moore, Boston, Massachusetts.

Claim—1st, The combination of the box and brush with the dust-pan, arranged as described, whereby the dust is prevented from escaping, 2d, And in combination with the above, the curtain, operating in the manner specified.

80. MACHINE FOR TURNING IRREGULAR FORMS; Z. F. Nance, Richmond, Virginia.

Claim—Passing the piece to be turned through the pattern, and the combination of the same with the swinging frame and parts connected therewith, as set forth.

81. STEAM BOILERS; Charles J. C. Peterson, Davenport, Iowa.

Claim—Arranging the feed pipe in such a manner under the fire-box, that the same, in combination with plates, placed between the bends of the feed pipe, constitutes the bottom of the ash-box, so that the feed water running through the pipe is heated by the ashes, said plates being so arranged that they can be raised and actuated by cranks and levers, so as to leave room for the ashes to escape.

82. ADJUSTABLE CARRIAGE SEATS; Henry H. Potter, Carthage, New York.

Claim—Attaching the seat to the body of the vehicle, as shown, or in any equivalent way, so as to admit of the seat being turned obliquely with the body, either to the right or left, for the purpose set forth.

83. ESCAPEMENT FOR TIME PIECES; George P. Reed, Roxbury, Massachusetts.

Claim—The improved escapement as constructed with its two impulse cams, or a double impulse pallet applied to the balance wheel axle, and to operate with the escape wheel, in combination with the double detent lever, lifting reverse cams or pallet applied to the detent lever of the escape wheel, and operated by a cam screw, or its equivalent, supporting the axle of the balance, essentially as explained.

84. STEAM GENERATORS; Robert E. Rogers, Philadelphia, Pennsylvania.

Claim—1st, The arrangement of the coils, constructed as described, the one being concentrically within the other, the annular spaces between the successive coils constituting direct and separate, and the only passages and outlets for the products of combustion, the entire lower portion of every coil having fire underneath it. 2d, The arrangement of the feed water pipe and the air feeding pipe in relation to each other and to the generating coils, whereby I am enabled to introduce the water in graduated quantities into the upper part of the coil, and use atmospheric air to force the water over or upon the heated surfaces. 3d, Imbedding the lower portion of each of the concentric coils in cast iron, cast around it to a greater or less height, for the purpose of protecting the coils from high degrees of heat.

85. FURNACES FOR EVAPORATING SUGAR JUICES; F. Roy, Parish of St. Bernard, Louisiana.

Claim—The setting of sugar kettles with the system of radial braces, so situated as to divide the space around the kettle into two apartments, communicating by the openings, when these upper chambers communicate with each other and by flues with a common flue, the whole operating as set forth.

86. FORCEPS FOR FASTENING CLASPS ON HOOP SKIRTS; George D., Samuel A., and Charles S. Russell, Birmingham, Connecticut.

Claim—The pliers having their jaws provided with recesses and lips, and with a lever or wedge-like attachment to operate in combination with the said lips.

87. BEE HIVES; Joseph D. Sanderson, Stetson, Maine.

Claim—The holes in the back of the hive communicating with the grooves in the doors, and the grooves in the under side of the top of the box, in connexion with the boxes provided with perforated plates, whereby the hive is perfectly ventilated, and the rain excluded.

88. GAS BURNING STOVES; Thomas Shaw, Assignor to self and C. S. Patterson, Philadelphia, Pennsylvania.

Claim—1st, The inverted cone, when arranged within and in respect to the hollow cylinder, and connected to the gas pipe, substantially as set forth. 2d, Extending the gauze disk beyond the opening for the passage of the gas, and so arranging the overhanging portion of the said disk that it shall be exposed to the air. 3d, The construction of the oven, consisting of the inverted box, its opening, and lining, and the inner cylinder, the whole being arranged to form the intervening passages, for the purpose set forth.

89. HARVESTERS; Oren Stoddard, Busti, New York.

Claim—The conical rollers, two or more, attached to the finger bar, in connexion with the sickle bar provided with an inclined back, and the cap plate, or its equivalent, the whole being arranged as set forth.

90. NUT MACHINES; Julius B. Savage, Southington, Connecticut.

Claim—The employment or use of the cutter, dies, and punch, in connexion with the conveyors, adjusters, and the jaws, or their equivalents, arranged as set forth.

91. WATER GAUGES FOR STEAM BOILERS; Thomas Stubblefield, Columbus, Georgia.

Claim—The combination of a float, a secondary valve, and a main valve, as set forth. Also, the method of preventing a too sudden opening of the main valve by insulating (in a chamber, or its outer side, exposed to the air) a quantity of steam.

92. ATTACHING CARRIAGE THILLS TO AXLES; John W. Sibbett, Cincinnati, Ohio.

Claim—The plate and socket or tube attached to the clip, in connexion with the pin attached to the thill, and the hook provided with a shank, and nut, and ratchet, the shank of the hook being fitted in the tube, and the ratchet having a pawl catching into or engaged with it, as set forth.

93. FLUID METRES; Charles Wm. Siemens, London, England; patented in England, March 4th, 1853.

Claim—1st, The construction of rotary fluid metres with a revolving wheel or drum, having tangential or oblique apertures, and connected with a counter, and inclosed in a fluid-tight case, and so arranged that the fluid to be measured flows from the centre towards the circumference of the wheel or drum. 2d, The application to rotary fluid metres of retarding vanes, substantially in manner described. 3d, Constructing the revolving part or wheel of a fluid metre and the fixed part or pipe which introduces the fluid into it, with two or more collars or flanches on one or both of the said parts, so as to check the passage of the fluid by the producing of eddies. 4th, Supporting the wheels or revolving parts of fluid metres by means of a flat or hollow plate or cap of steel, or other suitable material, attached to the wheel, and resting upon a fixed pivot, and combined with an oil chamber. 5th, Constructing fluid metres with a revolving wheel or drum having tangential or oblique apertures and retarding vanes, and provided with an oil chamber and pivot, and connected to a counter, and inclosed in a fluid-tight case. 6th, Constructing fluid metres with a dirt-box or strainer, arranged so that it may be opened and the dirt removed without disturbing the metre or the pipes. 7th, Constructing fluid metres with the wheel work, or a portion of the wheel work, of the counter, inclosed in an oil chamber which is exposed to the pressure of the fluid in the metre, substantially as described.

94. CULTIVATORS; Thomas Turner, Marysville, Ohio

Claim—The combination of the pulverizing mould board and hilling mould board, constructed as shown, and attached respectively to the longitudinally and laterally adjustable beams.

95. ADJUSTABLE CRADLE FOR DRY DOCKS AND MARINE RAILWAYS; Washington Van Dusen, Philadelphia, Pa.

Claim—The combination and arrangement of the cradle bars, jointed, connecting, and sliding bars, chains, and sliding lifting screw blocks, respectively connected together and to the cradles, frames, or ribs, in such manner and in such relation to each other as to enable the cradle bars to be adjusted to the bilge of the vessel desired to be hauled up, and to sustain the same by operating the lifting screws, on one side of the cradle frames.

96. SLIDE VALVE GEAR OF STEAM ENGINES; Elijah Ware, South Boston, Massachusetts.

Claim—The combination of the single eccentric having a short eccentric rod, the fulcrum plates carrying a fulcrum pin, having a connexion with the short eccentric rod, the slotted frame receiving the fulcrum pin, and a pin on the eccentric rod and the slotted plate receiving a pin, or its equivalent, attached to a rod connected with the valve.

97. LOCK; Charles S. Westcott, City of New York.

Claim—The ungearing of two sets of wheels when a lock is unlocked, in such a manner as to allow the slotted wheels which receive the tongue of the bolt to remain stationary while the remaining wheels can be turned to any desired position, so that the combination can be changed through the key-hole from the front of the lock, said ungearing being effected by means of a bar, or its equivalent, acting upon a movable piece of metal which supports the shaft upon which one set of wheels revolve, said bar being moved by the action of throwing the bolt, so as to throw one set of wheels out of gear with the slotted wheels when the lock is unlocked, and bring them into gear again when it is locked.

98. APPARATUS FOR OPERATING VALVES OF STEAM ENGINES; Norman W. Wheeler, Brooklyn, New York.

Claim—Actuating the cut-off valves of steam engines by means of an eccentric, or its equivalent, when the motion of the main valve is derived from the same eccentric, or its equivalent, but modified by a movement derived directly from a reciprocating part.

99. VALVE GEAR OF STEAM ENGINES; John L. Whetstone, Cincinnati, Ohio.

I do not wish to be understood as limiting myself to the precise arrangement or combination of parts, as described, but will vary them as circumstances may require, while at the same time I accomplish the same ends by means substantially the same, as, for instance, a sliding plate valve or a piston valve may be used instead of the rotating valve herewith shown; and in that case, if preferred, a forked arm may be attached to the rod which operates the cut-off valve, and the adjustable radius bar may be operated in the forked opening so as to give the cut-off valve a similar varying intermittent motion as that described. Or the arrangement of the parts may be reversed, as, for instance, placing the forked lever or arm on the rod or rock shaft which operates the main valve of the engine, and communicating motion to the cut-off valve therefrom through an adjustable radius bar, similar to that described; and, if desired, the governor may be made to operate the cut-off and throttle adjustments by a direct attachment of rods and levers to the rotating disk, or an equivalent device, without the worm wheel arrangement.

Claim—1st, Operating the cut-off valve by means of a forked arm or lever which is actuated by means of an adjustable radius bar which derives its motion from the rock shaft or from the eccentric which operates the main valves of the engine. 2d, Adjusting the radius bar by the variations of the speed of the governor, by means of a rotating disk operated by a worm wheel, said worm wheel being in such relation to the governor that when the governor is running at its right speed, no motion is communicated to the same, but when the governor runs either too fast or too slow, the worm wheel is turned in one direction or the other, and the radius bar is raised or lowered so that the cut-off is effected sooner or later. 3d, Operating the throttle and cut-off valve adjustments in combination, in such manner that the throttle valve is moved slowly, and is not closed to any considerable extent, while at the same time the cut-off adjustment is moved rapidly, and on the other hand, when the cut-off adjustment is in position for the shortest period of admission of steam, the movements of the throttle valve are the most rapid, the whole being accomplished in the manner substantially as described.

100. VALVES OF STEAM ENGINES; H. D. Wicks, Flint, Michigan.

I am aware that it is not new to have a valve constructed so as to serve as a steam chest. But I am not aware that the steam has been admitted to such valves in any other manner than from above the ports, which mode of admitting the steam subjects the valve, while operating, to a downward pressure, that causes it to bind on its seat, whereas, by admitting the steam from below the ports, the valve is subjected to an upward pressure, and thus is relieved from bind and wear while operating. I do not claim, broadly, so making a valve that it shall perform the office of a steam chest. But I

Claim—The valve having the ports and cavities, and suspended between screws, in combination with valve seat having the cavity or port, substantially as and for the purposes set forth.

101. MACHINE FOR DRILLING METALS; Robert Wilson, Milton, Pennsylvania.

Claim—1st, The adjustable inclined plane, for the purpose of increasing and decreasing the feed of a hand or power-drilling machine for all kinds of metal. 2d, The peculiar construction of the self-acting feed escapement combined with the adjustable inclined plane, for the purpose of throwing off and on the feed to suit any depth of hole within its entire descent, and then return again only to the height required within its ascent. 3d, The adjustable bearing against which the lower end of the feed hand rests, in combination with the involute or scroll, and the feed hand which works upon it, for the purpose of producing a safety adjustable self-acting pressure escapement.

102. FIRE ESCAPE LADDER; John Withers, Collinsville, Illinois.

Claim—1st, The combination of the canvass bag or shoot with the ladder, A, in the manner described. 2d, The combination of a bed and its frame, arranged to open and close, as set forth. 3d, The arrangement of the two ladders, A and B, with each other, and also the means of adjusting the ladder, B, substantially in the manner described.

103. BREECH-LOADING CANNON; Edward S. Wright and Theodore P. Gould, Buffalo, New York.

Claim—1st, A mortise made through the breech of a cannon, in combination with the sliding abutment. 2d, The expansive chamber, or its equivalent, in combination with the cannon and sliding abutment. 3d, The application of a wrought iron band shrunk around the breech of a cannon, when the same is combined with a mortise and sliding abutment, as set forth.

104. MACHINE FOR CUTTING SOAP; Wm. B. Manning, Assignor to self and L. H. Olmsted, Oswego, N. Y.

Claim—The machine described for converting block and slab soap into bars and cakes, consisting substantially of the frame or series of cutters, the guiding and supporting bars, and the presser or follower.

105. RAKING ATTACHMENT TO HARVESTERS; Joseph Young, Marshallton, Pennsylvania.

Claim—The arrangement of the rake bar, shaft, and rod, provided with friction roller, jointed connecting rods, attached to crank pulley, inclined adjustable plate, spring, and nut, substantially as set forth.

106. LAMPS; Nathaniel Cradit, Ripley, Ohio, Assignor to Chester G. Robinson, South Reading, Mass.

Claim—1st, The described, or equivalent arrangement, of draft passages, communicating with the oil reservoir and central tube, conducting the air and gases from thence to the interior of the wick. 2d, The box and shell, in the described combination with two rectilinear sets of wick elevating pinions, or their equivalents, by which two flat wicks are converted into one circular wick.

107. HEELS FOR BOOTS AND SHOES; Samuel Flint and Robert S. Rodgers, Assignors to Wm. F. Johnson, Lynn, Massachusetts.

Claim—An improved manufacture of heel made of wood and india rubber, combined and arranged together substantially as set forth.

108. FILE-CUTTING MACHINE; George W., Assignor to self and D. S. Fogg, South Dedham, Massachusetts.

Claim—1st, Controlling the opening of the regulating valve of an atmospheric trip hammer employed in a file-cutting machine, for the purpose of regulating the blow thereof, and producing a uniform depth of cut from end to end of the file, by means of a pattern whose form corresponds with, or has a proper relation to, the longitudinal profile of the file blank, applied and operating upon the said valve, substantially as described. 2d, In combination with the arrangement of the cutter guide block at a greater inclination from a vertical plane than the hammer stem, and with the fitting of the cutter or cutter stock loosely in said guide block—I claim the employment of a clamping piece, or its equivalent, applied to the said guide relatively to a proper bearing on the opposite side of the cutter, and operated substantially as described.

109. APPLYING GAS FOR HEATING AND ILLUMINATING PURPOSES; Calvin Pepper, Assignor to self and J. G. Treadwell, Albany, New York.

Claim—Passing coal or other inflammable gas, alone or in admixture with atmospheric air, through a stratum or mass of silicious sand without aggregation of particles to be inflamed at the surface, substantially as described, for heating purposes, and also for illuminating, as incident thereto, as described.

110. PLOUGHS; Thomas Wiard, Assignor to G. W. and H. W. Pitken, and W. L. P. Wiard, Louisville, Ky.

Claim—The standard with its permanent wing and recesses or shoulders, for the reception of the removable wing, constructed and arranged substantially in the manner set forth. Also, in combination with the standard, constructed as set forth, the adjustable cutting and guiding wheel, so that said wheel may be thrown into or out of action, as the circumstances of the case may require. Also, the uniting of the handles, beam, and standard together, by means of the pockets, dowels, recesses, and bolt, substantially in the manner described.

111. SLIDE VALVE GEAR FOR OSCILLATING ENGINES; Wm., Assignor to Richard Stephens, Old Forge, Penna.

Claim—1st, The combination of the two independently operating sliding bars and the levers, the former sliding bar being connected with the valves rock shaft, and furnished with fixed or adjustable stop pieces, and the latter being connected by an arm with the cylinder trunnion, and the whole operating to produce the motion of the valve or valves. 2d, Combining the stop-pieces with the sliding bar, by fitting them to slide in slots in the said bar, and attaching them to a double slotted wedge applied to the said bar, for the purpose of adjusting or varying the lead of the valve or valves.

112. STEAM BOILERS; I. C. Stern, Assignor to George W. Stone, Philadelphia, Pennsylvania.

Claim—The application to locomotive boilers of the arrangement of tubes described, that is to say, the arrangement of the coil, b, or its equivalent, on the inside and on one side of the fire-box, and the coil, b′, or its equivalent, on the opposite side, when one coil communicates with one pump, and the opposite coil with the other pump of the engine, and when the opposite coils are connected together by the pipe, d, so that the cold water direct from the pumps may pass into the coils, and thence in a heated state into the boiler, and so that the water may, at all times, circulate through both coils, as set forth.

113. LAMP SHADE SUPPORTERS; Wm. F. Shaw, Boston, Massachusetts.

Claim—The lamp shade supporter, with its upper and lower springs constructed of a single piece of metal, in the manner specified.

114. STRAW CUTTERS; Olive Ann Brooks, Somersworth, administratrix of the estate of Lebbeus Brooks, deceased, late of Great Falls, New Hampshire.

Claim—Two cutting knives or shears, or their equivalents, and so that, while one of them, when the machine is in operation, shall have a compound motion, whereby its cutting edge shall be made to move in an elliptical path toward and away from the trough, the other shall have only a reciprocating motion in a circular arc toward and away from the said trough, the lever frame carrying the lower knife or bed, being made to turn on a fulcrum rod, or its equivalent, and to be connected with the upper knife by means or mechanism essentially as described. Also, the application to the upper knife having a compound motion of a toothed rake, to operate therewith and facilitate the feeding of the straw forward in manner as specified.

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115. MODE OF CLEANING RICE; Wilson Ager, Rohrsburg, Pennsylvania.

Claim—The forcing of a current of air into or through the grain during the cleaning operation, for the purpose set forth.

116. CAR SEATS AND COUCHES; Horace L. Arnold, Elk Horn, Wisconsin.

Claim—1st, Jointing the ends of the seats next the sides of the car to a stud or bolt, so as to enable them to be arranged to right angles to the sides of the car, or to be swung round or turned to a diagonal position, and to thus occupy the spaces between them longitudinally and increase the width of the passage way, and thus admit of their elongation to convert them into distinct sleeping berths or couches. 2d, The combination of the slotted bar, eccentric lever, clamp, and plates, with lips or raised edges for firmly fastening the seats in the required position to answer their designs. 3d, The combination of the slides, or their equivalents, and the T-shaped bars for sustaining the backs of the seats in an inverted position, and bolts or slides for securing the backs in their said inverted position.

117. SEEDING MACHINES; John Badger, Bailyville, Illinois.

Claim—The circular plates and stirrers attached to the rotating shaft within the seed box, arranged and combined with the slotted bottom and slide, substantially as set forth.

118. PEGGING JACKS; T. D. Bailey, Lowell, Massachusetts.

Claim—1st, The method of jacking the last by turning the plate to which the last is fastened. 2d, The

combination of the lever, screw, and turn-table, for jacking the last. 3d, Fastening the screw, or its equivalent, stationary, by means of the coupling pin and plate, so that when the turn-table is revolved, it shall operate the lever and jack the last. 4th, Fastening the screw, or its equivalent, to turn the plate, after the last has been jacked, by means of the coupling wheel and pin operated by the thumb latch and spring, for the purpose of preventing the screw from turning round and loosening the lever. 5th, The combination of two hinges, cam levers, hinge seat, the link, and hand set-screw, for the purpose described.

119. HARVESTERS; J. A. Barrington, Fredericktown, Ohio.

Claim—The combination of the bell crank and guide piece with the crane and rod, connecting the crank arm with the rakes and the crank shaft, giving motion to the system. Also, connecting the entire raking mechanism with the vibrating frame, substantially as set forth.

120. STOVES; B. W. Belson, Philadelphia, Pennsylvania.

Claim—The combination of the air chamber surrounding the base of the fire-pot with the annular chamber at the upper part of the fire-pot. Also, the jet-pipe, in combination with the annular chamber and escape pipe. Also, the adjustable heater, constructed as described.

121. COMPOSITION FOR ROOFING; C. A. Bremner, Goshen, New York.

Claim—The composition consisting of marl and the other substances specified, combined and compounded in about the proportions and in the manner substantially as set forth.

[This is a compound of coal tar, rosin oil, india rubber, shellac, and linseed oil, with alum, litharge, borax, ochre, and dry marl, which, when mixed in the proportion specified in the patent, make an excellent and durable roofing cement.]

122. PEPPER CRUET; H. T. Clawson, Newbern, North Carolina.

Claim—Placing within the perforated top or cap of a pepper cruet or box, a rotating or reciprocating partially rotating brush, arranged substantially as set forth.

123. CUT-OFF GEAR FOR STEAM ENGINES; John Broughton, City of New York.

Claim—1st, The combination of the two rock shafts, their arms, the vibrating links, the rods, and the lifters, the whole applied to operate upon a tappet or tappets on the valve stem, or its equivalent, for the purpose of lifting the valve, and subsequently tripping it by the continued and inherent motion of the lifters. 2d, In combination with the above specified lifting and tripping mechanism, the combination of the pendulous rods, the toggle links, and the slide, or their equivalents, connecting with a governor or other means of adjusting the same to vary the positions of the centres of motion, for the purpose of varying the point of cutting off the steam.

124. HARVESTERS; Chester Bullock, Jamestown, New York.

Claim—Attaching the vibrating cutter to the vibrating bar and fingers, as described.

125. PROPELLER FOR LIFE-BOATS; Mortimer M. Camp, New Haven, Connecticut.

Claim—The method of propelling inclosed life-boats by the application of the power of the occupants of the boat, as set forth.

126. ELLIPSOGRAPH; E. G. Chormann, Philadelphia, Pennsylvania.

Claim—1st, Constructing the shoes in two parts, swiveled together as specified, in combination with the adjusting screw shaft. 2d, In combination with the screw adjustment of the movable shoe, the arrangement of the pencil or dry point carrier on a screw shaft, in order that the relative lengths of the axes may be readily varied to the smallest extent or a series of concentric ellipses be drawn varying very slightly in size. 3d, Arranging the drawing apparatus with a vibrating adjustable arm on a vertically adjustable arm, as described.

127. BREECH-LOADING REVOLVING FIRE ARM; E. Claude, City of New York.

Claim—Making the arm, between the barrel and exterior shaft, the bearing for the cylinder by a shaft on the forward end of the cylinder passing through and secured to the arm, when the said parts are combined with breech-piece and stock, so that the cylinder is rotated and stopped and the discharge effected, substantially as set forth.

128. SHINGLES; H. T. Clay, Gardiner, Maine.

Claim—1st, A shingle of uniform thickness at the butt so far as it is to be laid to the weather. 2d, A shingle that commences to taper at the point on the upper side, where the next layer above covers it, and tapers all on that side.

129. PRESERVE CANS; P. H. Cotton, Demopolis, Alabama.

Claim—In combination with the channel outside of the neck of the can, the employment of a recess in the neck and the extension of the rim of the cap over such recess.

130. BUCKLES; John Cumberland, Mobile, Alabama, and J. R. McClintock, City of New York.

Claim—The buckle or clasp composed of the parts, A and B, or their equivalents, substantially as described.

131. BAGASSE FURNACES; Felix Daunoy, Carrollton, Louisiana.

Claim—The construction of bagasse furnaces, having the exit flue located in the interior of the furnace with the openings to admit the gas from combustion, when in combination with the wood or coal chamber, having a skeleton crown, and the grates on which the bagasse is consumed.

132. SLIDE AND FASTENING FOR SKIRT HOOPS; Alexander Douglas and S. S. Sherwood, City of New York.

Claim—The combined clamp and slide made entire of one piece by forming the clamp of the divisions and the slide of the lips, as described, the divisions being entire and connected at both ends to the plate, as shown, thus forming a continuous connexion around the end of the hoop.

133. CARPET FASTENER; Richard DeCharms, Philadelphia, Pennsylvania.

Claim—An eyeleted carpet or floor cover binding, for the purposes set forth.

134. HYDRANTS; S. P. Francisco and Wm. P. Dickinson, Reading, Pennsylvania.

Claim—Providing said cylinder and piston with suitable openings for the admission of the air, and for the purposes set forth.

135. BALANCING MILL-STONES; John Fairclough, Louisville, Kentucky.

Claim—The arrangement of the cylinders within the boxes, the former being provided with tubes having

screw threads on their outer and inner surfaces, and provided with screws, and the cylinders provided with projections which fit in the grooves of the boxes, as set forth. Also, the plates and bottoms of the cylinders, when screwed on the tubes and used in connexion with the nuts.

136. Extension Finger Ring; Samuel Friend and George Seilor, City of New York.

Claim—The combination of the spring ring and folding bars, substantially as specified.

137. Machine for Separating Garlic from Grain; Philip C. Fritz, Barrytown, New York.

Claim—Separating garlic from grain by passing the same between crushing rollers, in the manner substantially as described, that the garlic seed and kernels of grain will be crushed separately between the rollers, and the crushed grain allowed to descend into a proper receptacle, while the garlic seed, on account of the moisture or juice they contain, adhere to the rollers, and are scraped therefrom.

138. Horse Power for Driving Reciprocating Saws; Edward M. Fuller, Salisbury, New York.

Claim—The connexion of the saw to the main body of a horse power which is operated by the circular movement of the animal, and extending the reciprocating rod, or its equivalent, from the main body of the machine across the track of the horse to the saw in such a position as to allow the horse to pass over it.

139. Cut-off Gear for Steam Engines; P. W. Gates, D. R. Fraser, and Thomas Chalmers, Chicago, Illinois.

Claim—The two sliding toe pieces, constructed as described, and applied within the rocking frame, to operate in combination with the double lifters attached to the valve stem, and with a stud and roller, or their equivalent, connected with a governor, or otherwise made movable.

140. Medicated Fabrics; Henry Glynn, Baltimore, Maryland.

Claim—Cloth or paper chemically prepared, for sanitary purposes, with a solution of which copper, or copper and calomine, are the bases, such manufactured article being designed for the prevention, or as a protection against, infectious or contagious diseases, and made as stated.

141. Paper Files; Edward R. Godfrey, City of New York.

Claim—The method of securing and transferring hooks to the back or steadying weight, by folding and uniting their ends down the entire length of the channel or groove in the lower surface of the back, so as to prevent them from twisting and dropping the file of papers, as would be the case if the ends of the wires were simply riveted into the back.

142. Seats and Sleeping Couches for Railroad Cars; Plymon B. Green, Chicago, Illinois.

Claim—1st, The arrangement under the seat, of a sliding drawer which has one portion of its top cushioned, and the other portion open, in combination with the hinged back, or cushion and stationary cushions. 2d, In combination with the above, the arrangement of the upper couches on hinges in the peculiar manner specified, so that they can be adjusted with facility.

143. Hanging Window Sash; Theodore F. Hall, Marietta, Ohio.

Claim—The employment and arrangement of pulleys or friction rollers at the lower corners of the sash, and the balancing of the sash on cords, in combination with pulleys and weights, or a weight, substantially as set forth.

144. Manufacture of Portable Fans; John C. Hall, Fayette, Mississippi.

Claim—The fan, when constructed in the manner described.

[This invention consists in having a series of short bars or rods jointed together, so that they may be folded into a compact cylindrical form, and distended to an annular shape. The bars or jointed rods form the frame of the fan, and a piece of silk, or other suitable material, can be attached to them to form a cover or body, which, when the frame is distended, is stretched sufficiently tight to form an efficient fan. The fan, when the frame is closed or folded, occupies very little space.]

145. Railroad Rails; Augustus Plinta, Albany, New York.

Claim—The construction of a railway rail by forming the same of a hollow of an elliptical or oviform shape in cross section, the lower portion of the arch being extended into a foot or flanch, and a segment of the upper arch being extended into a lip or face for the tread of car wheels, slots being made through the bottom and across the lower part of the body of the rail, substantially in manner and form set forth.

146. Manufacture of Scissors; Henry Havell, Newark, New Jersey.

Claim—The forming of the blades of scissors or shears by means of the use of the intermediate plate, or by soldering or brazing the malleable cast iron and steel together. Also, in the manufacturing of scissors or shears, the use of the die, as before mentioned, and the striking together and into the required line and shape, the component parts of the blades, substantially in the manner described.

147. Method of Gathering Grain upon, and Discharging it from, the Platform of Harvesters; Obed Hussey, Baltimore, Maryland.

Claim—The method described of gathering grain upon and raking it from the platform of a reaping machine, and depositing it upon the ground, by a raker riding on the machine directly behind the horses, and the gearing facing obliquely towards the grain which the machine is advancing to cut, and who, at a single operation with his rake, first, presses the grain in front of the machine backward against the cutter and over upon the platform; secondly, by a pivotal motion turns the prostrate grain upon the platform with its stalks parallel to the cutter; thirdly, slides the grain endwise off the platform at the side of the machine; and, fourthly, deposits the grain in a gavel on the ground behind his seat and across the track of the driving wheel of the machine.

148. Hoop Lock; Edwin A. Jeffery, Corning, New York.

Claim—A hoop lock composed of a shell or socket and a taper pin, made as described.

149. Bottle-stoppers; Thomas Lewis, Malden, Massachusetts.

Claim—A ball valve-stopper, as made with the separate cap provided with a discharging tubular mouth and crossed bars, or equivalents, for detaining the ball, as described, and connected with the main tube or body by a screw, or its equivalent.

150. Folding Bench; Tristram S. Lewis, Kendall's Mills, Maine.

Claim—The arrangement and combination of the hinge blocks, the leg slides, and the confining slide, as applied to the parts, A B, and their legs connected or hinged together so as to fold up.

151. MACHINES FOR ELEVATING HAY, &c.; James C. McGrew, Smithfield, Ohio.

Claim—The arrangement of the bar and inclined platform, with the shears and hoisting fork, substantially as described.

152. BUOYANT PROPELLER; James Montgomery, City of New York.

Claim—1st, The described or substantially equivalent means of securing the flotation of a screw propeller by ejecting water therefrom by centrifugal action. 2d, The detachable hollow blades in the described combination with the shaft, for the purposes set forth. 3d, The application of the valve, arranged as described, in the forward end of the hollow shaft, for the purpose explained.

153. SEEDING MACHINES; Albert W. Morse, Eaton, New York.

Claim—The arrangement of the hopper with the rollers, g g, belt or strap, E, rollers, m, and rings, as described.

154. DRAFTING SHIRTS; John Peckham, New Haven, Connecticut.

Claim—Drafting shirts by means of the neck and breast measures, formed and applied to the cloth, as shown and described, so that the neck circle will be chiefly cut or formed in the back portion of the shirt, and the upper part of the back portion folded over and united to the top of the front portion on a line with the base of the neck, as set forth.

155. QUOINS FOR GUN CARRIAGES; David D. Porter, U S. Navy.

Claim—The combination and arrangement of the degree rack or racks, the axle thereof, the T-bolt and its groove, with the bed and wedge. I do not claim the mere use of raised projections for indicating numbers by the touch of the fingers, as I am aware that such is not new. But I claim the combination and arrangement of the tangible scale and axle with the degree rack and the wedge, so that by the application of the finger to both scale and axle at one and the same time, and during the night, or otherwise, the proper position of the wedge may be determined for any desirable elevation of the gun.

156. SELF-ADJUSTABLE LEVELING INSTRUMENT; Joseph Redhead, Woodville, Mississippi.

Claim—Combining with the dish or case an inclined rod and ball or weights, so that when said case is set upon an inclined staff by its steel point, the ball will swing in the case into a level position, for the purpose of making a leveling instrument for ascertaining the ascent or descent of ground, as set forth.

157. MACHINE FOR BORING WOOD; George F. Rice, Worcester, Massachusetts.

Claim—The hollow cross-bar, together with the double head bolt, which enables the operator to fasten the uprights at any angle by simply turning one nut.

158 GOVERNOR FOR STEAM ENGINES; H. C. Sergeant, Columbus, Ohio.

Claim—1st A steam engine governor composed in part of a steam engine which is subject to a uniform resistance, and which works independently of, and by its own velocity controls the velocity of the engine to be governed, substantially as set forth. 2d, The employment of two disks having spiral projections on their faces, and provided with stop pins, applied to combine an engine which is to be regulated, with an isochronous revolving regulator. 3d, The combination of what is herein termed the "regulator engine," its regulator and regulating valve, or their equivalents, and the shafts, H and M, and their spiral-faced disks, one driven by said engine, and the other by the engine to be governed, the whole applied and operating in combination with a regulating valve, or its equivalent, substantially as described.

159. BRUSH; Reuben Shaler, Madison, Connecticut.

Claim—A brush, the bristles of which are secured by winding them into a spiral groove, and fastening them in the manner described, or by winding them into cement, as set forth.

160. BOILER FURNACES; Evan Skelly, Plaquemine, Louisiana.

Claim—The combination and arrangement of the gradually contracted fire chamber with the bridges, as described.

161. HARNESS BUCKLES; Orin B. Smith, Monticello, New York.

Claim—The combination of the lever, operating as described, with the bow, for the purpose of making a harness or other buckle, and to which may be attached straps, as set forth.

162. HOMINY MILLS; Ira Speight, Woodville, Mississippi.

Claim—Hanging mill-stones by means of right and left screws, substantially as set forth.

163. BUCKLES FOR SKIRT HOOPS; John Stevens and James Handley, City of New York.

Claim—The buckle, when constructed substantially in the manner described, in combination with the slides, having holes to receive the hook of the buckle.

164. MITRE BOX; Asa F. Tarr, Rockport, Massachusetts.

Claim—A mitre box having a sliding frame attached to pivoted standards, and otherwise made, as described.

165. CAM PRESS; Enoch Thomas, Beverly, Virginia.

Claim—The mode of making and arranging the journal boxes so as easily to vary the space under the follower, and retain the uniform position of the pressure, in combination with the cam and windlass, cast solid, when constructed and operated substantially as specified.

166. DYNAMOMETER; Wm. Tucker, Blackstone, Massachusetts.

Claim—The combination of the grooved slider and its screw connexion with the index pointer, or its equivalent, and the spring and pulley, or its equivalent, applied to a shaft, substantially as described, the slider having a feather connexion with the said shaft, as explained.

167. PLOUGHS; Reed Vincent, Rockton, Illinois.

Claim—The combination of the convex standard, the braces, and the mould-board, when arranged in connexion with the beam and bent handles, as described.

168. LABELS FOR TREES, &c.; Francis T. Cordis and Wm. W. Wade, Long Meadow, Massachusetts.

Claim—The combination of a metallic ring or back with paper, or other suitable substance, on which is written or printed the name of a tree, shrub, plant, or seed, and a plate or plates of mica and a metallic ring, in either of the modes described, as a tag or label for designating and distinguishing the varieties of trees, shrubs, plants, and seeds in orchards, nurseries, and gardens.

169. APPARATUS FOR PURIFYING GAS; Andrew Walker, Claremont, New Hampshire.

Claim—The combination and arrangement of separate chambers, opening into each other in such man-

ner that a current of water or fluid may be made to flow through the series in thin falls or sheets, or from one chamber to the next in a thin fall or sheet, and a current of gas be made to pass upward and through the several chambers, and successively through and against the several falls or sheets of fluid, the chambers being disposed one over the other in column, and the whole being to effect the purification of gas for illumination, as described.

170. Stoves; David Wells, Lowell, Massachusetts.

Claim—The arrangement of the flues, smoke chamber, air-heating chamber, and fire chamber, the latter communicating with the smoke chamber by means of the perforations, and the smoke chamber communicating with the air-heating chamber by perforations, substantially as set forth.

171. Manufacture of Glass Furnaces and Pots; Ezra Wells, Covington, Pennsylvania.

Claim—Pots and furnaces made of the black American clay, for use in manufacturing glass and glassware, substantially as set forth.

172. Method of Attaching Cutting Lips to Auger Shanks; Norman S. White and Aaron Denio, Shaftsbury, Vermont.

We do not claim, broadly, attaching the cutting parts to the screw shaft of augers. But we
Claim—The specific manner set forth and shown in the specification.

173. Smut Machines; J. A. Woodward, Burlington, Iowa.

Claim—The arrangement of the wire cloth cylinder, scourer, deflecting or separating bar, spout, and shoe, as set forth.

174. Instrument for Measuring Altitudes, &c.; George C. Ayling, Assignor to self and Henry A. Ayling, Boston, Massachusetts.

Claim—The arrangement of the index glass with respect to the detector glass, so as to enable the latter to be moved either into parallelism with, or at right angles to, the former, and combining with the detector glass and the main divided arc and index, a secondary index and divided arc, applied to register the movements of the detector glass, substantially as described.

175. Watch Faces; Samuel Baldwin, Assignor to Baldwin & Co., Newark, New Jersey.

Claim—Arranging the figures of the dial without turning the works of the watch in a plane parallel to its face, so that they may be in the proper positions in relation to the pendant, whether the dial faces be the open or closed bizzle of the case.

176. Clothes Frame; Wm. Hathaway, Assignor to Wm. G. Maynard, Worcester, Massachusetts.

Claim—Arranging the centre of motion of the cross-bars, so that the centre of motion of the outer end of the cross-bar, when the frame is closed, will be over or within the centre of motion of the inner end of the cross-bar.

177. Hemp Brakes; Robert Heneage, Assignor to self and Edward O. Ball, Buffalo, New York.

Claim—1st, The combination of the reversing mechanism with the brake, beater, and shell, for the purpose of dressing hemp, as set forth. 2d, The combination and arrangement of the brake with the revolving beater, shell, and revolving apron, for the purpose of dressing flax. 3d, The arrangement of the chamber within the machine, for the purpose of affording room for the movements of the hemp while being dressed, substantially as described.

178. Machine for Turning Tapering Twists on Wood; Reuben K. Huntoon, Assignor to self and Jacob B. Rand, Concord, New Hampshire.

Claim—The arrangement of the several separate devices described, when operated as set forth, for turning irregular tapering forms of wood.

179. Manufacture of Paper Pulp from Wood; Charles Marzoni, Assignor to J. Gandolfo, City of N. York.

Claim—1st, The use and application of the peculiar stone called "adamantine," described, when used as a means of tearing the woody fibre into a state suitable for pulp for paper, by rotation, or any other substantially similar manner. 2d, I do not claim steaming the wood, nor the use merely of hot water—but I claim the combining the use of the hot water at the boiling point, or 210° Fah., with the stone in rotation while acting upon the wood simultaneously and continuously, so that the hot water and flakes or particles of woody fibre immediately become united into pulp. 3d, The apparatus consisting of the cover or box, the boxed openings therein, and arms, rods, and weights, by which the blocks of wood are fed and held to the surface of the stone.

180. Faucets; Martin Robbins and James Powell, Assignors to James Powell, Cincinnati, Ohio.

Claim—The application to the key stem of the collar, cushion, and loose collar, or their equivalents, arranged in combination in the manner described, to compensate for the lateral wear or displacement of the stem.

181. Ice Pick; John L. Rowe, Assignor to Frederick Stevens, City of New York.

Claim—The spiral spring, in combination with the handle, rod, and point, arranged substantially as specified.

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182. Boot Jack; Frederick Ahl, West Meriden, Connecticut.

Claim—The arrangement of the platform, vibrating arm, and cross-bar, as described.

183. Letter Envelope; James G. Arnold, Worcester, Massachusetts.

Claim—Making letter envelopes by cutting, folding, and pasting the paper, substantially in the manner described. Also, folding narrow folds at the ends or sides, so as to come inside between the face and back, in the manner described.

184. Manufacture of Pyrogenic Oils; Luther Atwood, Brooklyn, New York.

Claim—Forming oleaginous vapors from substances yielding pyrogenic oils, by the action of the heat of a properly regulated current of products of combustion passing over and above the surface of the mass, operated on with or without the aid of external heat, substantially as described.

185. Apparatus for Destructive Distillation; Luther Atwood, Brooklyn, New York.

Claim—The combination and arrangement of a "distilling tower" and receiving vessel with a steam blast,

or its equivalent, in the combination, for the purpose of producing an induced current, substantially in the manner described.

186. Apparatus for Destructive Distillation of Wood, &c ; Luther Atwood, Brooklyn, New York.

Claim—1st, The use of the inner case in the manner set forth. 2d, The described arrangement of the flues leading from the annular passage into the distilling tower. 3d, The combination with the distilling tower of the combustion chamber or fire-place, when so arranged as to supply products of combustion by a downward draft through the fire-place, substantially as described.

187. Lamps; William W. Batchelder, City of New York.

Claim—The small tapers or wick tubes, D, placed on both sides of the flat burner or wick tube, C, in combination with the cap, when the said tubes and cap are used without a chimney, substantially as set forth.

188. Manufacture of Artificial Fuel; Wm. A. Bradley and Jacob Bigelow, Washington City, D. C.

Claim—The manufacture of artificial fuel made from refuse bituminous coal, anthracite or charcoal, combined with the substances herein described.

189. Grain Measure; Job Brown, Lawn Ridge, Illinois.

Claim—A grain tally having a slide operated by a pendent and spring, a lever, pawl, ratchet wheel, and indicating belt, the whole combined as described.

190. Revolving Fire Arms; John W. Cochran, City of New York.

Claim—1st, The hinged or jointed thumb-piece of the hammer or cock, constructed as set forth. 2d, The worm-wheels upon the cylinder shaft, and the tumbler shaft or hammer shaft, combined as described. 3d, The means, substantially as set forth, for allowing the cylinder to be rotated within its frame independent of the shaft of the hammer or tumbler, and also allowing of the detaching of the cylinder and its shaft from the frame and from the means of rotation.

191. Compensating Pendulum for Clocks; Wright S. Coffinberry, Grand Rapids, Michigan.

Claim—The combination of two metals of different expansibility, in the manner and for the purpose set forth.

192. Stump Extractors; Francis M. Eagle, North Manchester, Indiana.

Claim—Overcoming the resistance by the movement of a roller invariably connected with the stump upon a track either rectilinear or curved, all parts of which, except the starting point of the roller, are exterior to the circle, with the invariable connexion for a radius, and the point of attachment of the hook for a centre, the operation being substantially as described.

193. Stoves; Nelson Edwards, Chittenden Co., Vermont.

Claim—The application to a stove of an improved combined hydro-atmospheric jet and gas chamber. Also, the stove-contained coiled smoke-pipe, in its combination with the plurality of stove walls, substantially as described.

194. Spring Bottom for Chairs and other Seats; Patrick Gallagher, Pleasant Unity, Pennsylvania.

Claim—Making the bottoms of chairs, or other seats, of spring plate metal, so that, when laid loosely upon the frame, said plates shall be both a bottom and a spring, substantially as set forth.

195. Printing Press; S. R. Cotton, Green Bay, Wisconsin.

Claim—Operating the form bed from the pressure cylinder, B, by means of the cam or eccentric, M, provided with the pin, o, rack bar, D, provided with the projection, p, and roller, n, the pinions, E G, on the shaft, F, with or without the pinion, H, slide bar, L, and spring, s, and the rack bar, I, as set forth. Also, the toothed sector which gears into the pinion of roller, a′, and is connected with the rack bar, D, by means of the slotted arm on the rack bar, and the arm of the sector provided with the pin, o, the rod, c′, attached to the arm, d′, the pawl, i′, attached to the arm, d, and the ratchet, h′, attached to the roller, g′, the whole being arranged so that the inking device will be operated automatically from the pressure roller. Further, having the bearings, b b, of the pressure cylinder, attached to rods, d d, which are connected by tension nuts to straps that encompass the eccentrics, g, of the shaft, h, for the purpose of readily raising, when necessary, the cylinder, B, and regulating its pressure.

196. Steering Propeller; H. E. Teseel, Chicago, Illinois.

Claim—The arrangement and combination of the slotted frame, propeller, driving shaft, and chair wheel, substantially as described.

197. Seeding Machines; Joseph Fowler and F. M. Bacon, Ripon, Wisconsin.

Claim—The reciprocating perforated slide, stationary perforated slide, and perforated roller, in connexion with the inclined board, arranged to operate as set forth.

198. Shuttle Boxes for Looms; A. F. Gibboney, Union Township, Mifflin Co., Pennsylvania.

Claim—The half swell on the inner end of the fly to be operated on by the picker, as set forth.

199. Sash Fastener; Porter A. Gladwin, Pawtucket, Massachusetts.

Claim—The employment of the perforated plate with the notch spring, as described.

200. Propeller for Boats; James Hamilton, City of New York.

Claim—The arrangement of two sets of propeller buckets in a reciprocating frame, so that they act in opposite directions to give head or stern way respectively, when said buckets are combined with sliding stops, fitted and acting to retain one set of buckets in a folded and inoperative position, while the other set is acting to move the vessel, as set forth.

201. Typographer; Henry Harger, Delhi, Iowa.

Claim—1st, The employment or use of the bed-piece, frames, D and C, and type frame formed of the plates, E E, arranged substantially as set forth. 2d, The particular means employed for feeding the frame, C, and paper or wax to the type, to wit: the bent lever connected to the hand lever, the ratchet, and cords or chains attached to the frame, C. 3d, Regulating the feed movement of the frame, C, by having the types made of varying heights or lengths, so as to give corresponding lengths of vibration to the lever, substantially as described.

202. Furnaces for Burning Lime; Thomas R. Hartell, Philadelphia, Pennsylvania.

Claim—As an improvement in reverberatory furnaces for burning lime, providing a recess in the side walls in which a corresponding projecting edge of the fire-proof traveling platform fits, in the manner de-

scribed, for the purpose of cutting off all communication between the heated upper chamber and the cool lower chamber, at the same time presenting no obstruction to the forward movement of the truck and platform.

203. LOCK; Spencer Hiatt, Indianapolis, Indiana.

Claim—1st, The combination and arrangement of the tumblers and key bits with the lever, sliding yoke, and lever arms, when constructed as set forth. 2d, The combination of the comb spring and slide with the tumblers, when constructed as set forth.

204. BREECH-LOADING CANNON; John W. Hollensbury, Alexandria, Virginia.

Claim—1st, A breech-loading cannon formed in two parts and secured together by means of a frame. 2d, In combination with the two divisions of the cannon the frame fitting closely up against the breech and capable of being elevated or depressed, as set forth. 3d, In combination with the two divisions of the gun, the band or circular wedge, constructed as described.

205. LADIES' HOOPED SKIRTS; John Holmes, Boston, Massachusetts.

Claim—The net-work fabric described, having the number or size of its meshes reduced toward the top in such a manner as to throw the fullness in one direction or on one side, so that when the hoops are inserted it is self-sustaining, to produce the "bishop" or "bustle" form, and preserve that form to the bottom of the skirt, as set forth, without the use of lacings, springs, extra "bustles," or other contrivances.

206. METHOD OF ADJUSTING THE TRIPPER TO THE ESCAPEMENT LEVER OF TIME-KEEPERS; Edwin B. Horn, Boston, Massachusetts.

Claim—The movable plate, or its equivalent, supported so as to be capable of turning on a pivot, or its equivalent, carried by the stand, the same being for the adjustment of the beat or the pin or tripper of the escapement lever, as specified.

207. INKSTAND; Thomas S. Hudson, East Cambridge, Massachusetts.

Claim—The arrangement of a vent hole within the flexible or elastic diaphragm, and with respect to the ink receiver, essentially in manner as described.

208. TOOL FOR SLOTTING CLOTHES PINS; John Humphrey, Keene, New Hampshire.

Claim—Arranging knives or cutters to widen or flare the outer ends of the slots in clothes pins simultaneously with the sawing thereof, by having portions of the plate of the saw removed, and the cutters secured to the disks or flanches on the arbor, and held thereby independent of the saw, by which arrangement a perfect and complete slot may be cut at a single operation, and the cutters may be quickly and accurately adjusted to any required position, and be securely kept therein or be readily removed when desired.

209. PROPELLING AND STEERING APPARATUS; Samuel Huse and Samuel Huse, Jr., Chicago, Illinois.

Claim—As an improvement in propellers when hung within the rudder and operated by gears, receiving the end thrust of the propeller shaft upon the sleeve on the post, arranged as described.

210. SPRING TACKLE BLOCK; Obed Hussey, Baltimore, Maryland.

I do not confine myself to any special form or arrangement of the strap and the block, or of either (as these may be indefinitely varied), so long as the block is constructed with a seat to yield to the force of sudden shocks, and thereby prevent the dangerous jerks, which, as described, it is the object of my invention to prevent. But I

Claim—A block having a yielding seat, substantially as set forth.

211. PRESERVING FRUITS; John R. Jenkins, Kingston, Pennsylvania.

Claim—Dusting the articles to be coated with any dry powder, such as plaster of Paris, or its equivalent, to prevent the coating from adhering to the articles coated, and permitting it to come off readily.

212. GAS RETORTS; Wm. H. Laubach, Philadelphia, Pennsylvania.

I do not desire to confine myself to the particular form of the retort illustrated, or to the exact shape of the plate, D, inasmuch as both may be considerably modified in shape without any deterioration of the result.

Claim—Dividing the retort into an upper and a lower chamber by means of a movable plate, D, said plate being so constructed and so arranged in respect to flanches or projections in the retort, and being so weighted that the amount of vapor admitted into the communication between the two chambers shall be proportionate to the rapidity with which it is generated, and that the vapor shall pass from the lower chamber in a stream so attenuated and so exposed to red-hot surfaces, as to insure its being converted into permanent gas on entering the upper chamber, as set forth.

213. CLOTHES HORSE; Tristram S. Lewis, Kendalls' Mills, Maine.

The arrangement of the four spring catches is such that the spring, while operating to press the horse open, and to maintain it in an extended state when unfolded, will also operate to maintain all the catches in engagement with their respective slats. Therefore, when the posts are hinged together, and the four folding sets of slats are applied to them, and arranged on them as described, I

Claim—The arrangement of the spring and the two sets of spring catches, in order that the said spring may perform at one and the same time the two functions, as specified.

214. FRUIT CANS; W. W. Lyman, West Meriden, Connecticut.

Claim—In combination with the groove for receiving and holding the packing and the flanch on the cover, fitting into said groove and against the packing, the sleeve with its cam slots, and the studs on the neck of the can, for drawing the flanch of the cover tight down on to the packing without crimping it.

215. CULTIVATORS; Howard Mann, East Attleborough, Massachusetts.

Claim—1st, The application of each wheel arbor to its wheel and the frame, so that the wheel may turn on the arbor and the latter extend into slots, and have fastenings, whereby not only the wheel may be adjustable with reference to the cutters, but the arbor and its screws and nuts may be employed to strengthen the frame. 2d, The described arrangement of each of the slots of the wheel arbor, with respect to the scraper of the periphery of the wheel, whereby the wheel at whatever altitude it may be placed while its arbor is in the slots, will be at one uniform or proper scraping distance from the scraper. 3d, The application or arrangement of the slide bar of the cutter, so as to operate not only as a scraper to the wheel, but as a supporter of the cutter post or rod.

216. SEED PLANTERS; F. M. Marshall, Seguin, Texas.

Claim—The arrangement of perforated plates, beam, gauge wheel, bull tongue plough, roller, crank, arm, and handles, the whole being constructed as set forth.

217. Machines for Picking Corn; S. W. May, Gatesburg, Illinois.

Claim—The bars, the elevators, the fingered belt, the frame, the crank with its pitman, or their mechanical equivalents, the whole being combined as set forth.

218. Locomotive Axle Bearings; David Matthew, Philadelphia, Pennsylvania.

Claim—The peculiar construction of journal-box or bearing in one piece, having a longitudinal slot or opening, operating substantially as set forth.

219. Door Spring; T. J. Mayall, Roxbury, Massachusetts.

Claim—The described india rubber torsion door spring.

220. Shirt Stud; Charles McIntire, Newark, New Jersey.

Claim—The latch and catch, constructed substantially in the manner set forth.

221. Corsets; Anne S. McLean, Williamsburg, New York.

Claim—Providing the upper sections or pads of the corset with cone-shaped flat steel, or their equivalent springs and spring supporting plate next the body, for the purpose of giving elasticity to the pads, which pads are held in their places by the weight of the corset.

222. Iron Pavements; Richard Montgomery, City of New York.

Claim—A metallic pavement, consisting of a series of parallel arched corrugations, reaching or extending from the curbstone on one side of the street to the curbstone on the other side. Also, casting or making the upper parts of the corrugations thicker than the lower parts, in the manner set forth. Also, supporting or anchoring the pavement when it is cast in sections by a grooved central support, as shown. Also, the dovetailed recesses and projections, in combination with the projections, for the purpose of holding the pavement in place.

223. Device for Transmitting Rotary Motion; Henry Morris, West Philadelphia, Pennsylvania.

Claim—The combination of the convolute gear and convolute groove with a sliding pinion or gear, substantially as described.

[This invention consists in the combination of two beveled gears, one of which has its teeth arranged in convolute form, and the other of which, gearing with the first one, has its teeth concentric to its axis; the latter being fitted to slide on its shaft that it may, when geared with and driving or being driven by the first one, approach or recede from the axis of the same under the guidance of a convolute groove, which is formed between the convolute coils of teeth, and be thereby caused to receive from or impart to the first one a gradually increasing or diminishing velocity. The device may be applied to many purposes in machinery, but is more particularly intended to be applied to the spinning mule, the first gear being secured to what is known as the "scroll shaft" of the mule to drive the other one, which is attached to a shaft which drives the rollers, for the purpose of producing a gradual diminution of speed of the rollers before stopping them after the mule carrier has moved out a certain distance from the rollers, and thereby prevent the jerk on the yarn, which is caused by stopping the rollers suddenly.]

224. Blind Fastener; John Murphy, Boston, Massachusetts.

Claim—The arrangement of the spring catch on the pintle step shank, and with respect to the notched pintle. Also, combining with the catch and its case a movable projection or cover, applied so as to be capable of being moved on and off the pintle head, and to carry the thumb projection or stud of the catch, substantially in manner specified.

225. Lathe for Turning Masts, &c.; P. H. Niles, Boston, Massachusetts.

Claim—1st, The revolving traversing cutters, in combination with the dogs, or their equivalents, for supporting the stick of timber, operating in the manner described. 2d, Raising the dogs automatically as the cutters approach them. 3d, The method of controlling the position of the cutters by means of the combination of the slotted wheels, the gears, and the pattern, and their connexions, substantially as set forth.

226. Construction of Iron Railing; James Nuttall, New Orleans, Louisiana.

Claim—The combination of bent sheet metal rails, with grooves in the panels, receiving the edges of the rail, and giving an internal and external bearing to the rail, substantially as set forth.

227. Lathe Machine; Jacob Pefley, Bainbridge, Indiana.

Claim—The combination of the reciprocating knife, the bolt supports or bars, and the stationary bar or bed, arranged substantially as set forth. Also, the shaft provided with the bent rods, and connected or arranged with the rock shaft of the bars through the medium of the levers, bars, and the arm, substantially as set forth. Also, in connexion with the knife, bars, and bed, the registering device operated from the rock shaft through the medium of the pawl connected with the lever, rod, and bent lever, so as to be thrown in contact with the ratchet by the bolt, as set forth.

228. Cores for Moulding Plastic Substances; James Pilgrim, New Britain, Connecticut.

Claim—Constructing cores for moulding in plastic clay, cement, or other like substances, of india rubber, or equivalent material, so that they be inflated and collapsed, substantially as described.

229. Pestles for Cleaning Clothes; Ezra Pollard, Albany, New York, Assignor to self and B. W. Seeley, City of New York.

Claim—A clothes pounder or pestle composed of a stock, handle, tubes, and openings, as described.

230. Burnishing Attachment for Lathes; James S. Ray, East Haddam, Connecticut.

Claim—The arrangement and combination of the plate, E, plate, F, spring, mandrel, and tool, as described.

231. Steering Apparatus; Jesse Reed, Marshfield, Massachusetts.

Claim—1st, The duplex screw shaft, in combination with the nuts and guide rods, the rods being each permanently connected with one of the nuts, and passed through the lug on the other nut, operating in the manner specified. 2d, In combination with the above, connecting the nut to the rudder head by means of the arm, bulb, and rod, operating substantially as described.

232. Trace Fastenings; Neil J. Reynolds, Webster, New York.

Claim—1st, The formation of the eye which receives the tongue, for the purpose described. 2d, The tongue, in combination with the tube, spiral spring, and bolt, which fastens the tongue in the eye.

233. Rrailroad Car Brakes; J. W. Rice, Springfield, Massachusetts.

Claim—1st, The suspension bar, crotch bolt, and nut, when arranged and operating in the manner de-

scribed. 2d, The continuous rod and loose pulley, in combination with the suspension bar and crotchet bolt and nut, when arranged and operating substantially as set forth. 3d, The loose collars on the standard, when applied in the manner set forth.

234. BEDSTEAD FASTENING; Oliver Robinson, Rochester, New York.

Claim—The combination and arrangement of the hooked locking bolt with the circular wrench and eccentric, for holding the bolt by means of the lip in the proper position for entering the post and tightening the connexion made with the pin, or its equivalent, substantially as set forth.

235. APPARATUS FOR WALKING ON THE WATER; Henry R. Rowlands, Boston, Massachusetts.

Claim—The construction and use of the apparatus by the arrangement of the metal floats, the metal ballast boards, and the wooden stanchions, in a manner substantially as described.

236. DREDGING MACHINE; James Stewart, New London, Connecticut.

Claim—The arrangement of three series of dredging buckets in the same dredging machine, for the purpose of excavating a channel in the earth throughout the entire width of the boat. Also, arranging the windlass barrels which raise the dredging apparatus out of the water, on the same shaft that operated the dredging chains, so that they may be locked to the shaft to raise the dredging apparatus without stopping the chains of dredging buckets, substantially as described.

237. BURRING MACHINE; O. W. Stow, Southington, Connecticut.

Claim—The arrangement and combination of the spring, gauge, and rollers, substantially as described.

238. MANUFACTURE OF STARCH; S. T. Stratton, Philadelphia, Pennsylvania.

Claim—Steeping the material from which the starch is extracted, either whole or crushed, in an alkaline or caustic alkaline liquor of a suitable strength and artificially beaten to a temperature of from 70° to 130° Fah., as specified.

239. WASHING MACHINE; G. W. Swigert, Monmouth, Illinois.

Claim—A cylinder of brushes, a concave supported on spring, guard, attached to rod, pounders, tappet drum, and otherwise constructed as described.

240. CLOSET FOR SEWING MACHINES; Wm. P. Uhlinger, Philadelphia, Pennsylvania.

I do not desire to confine myself to the described construction or combination of the various parts in every minutia. But I

Claim—Combining the sewing machine platform with the lid of the closet, that the opening and shutting of said lid shall operate the platform, substantially in the manner set forth.

241. RAILROAD CAR SEATS AND COUCHES; Nathan Thompson, Jr., Brooklyn, New York.

Claim—1st, The combination of longitudinal seats, with a raised platform and berths or reclining places beneath the seats and platform. 2d, In combination with berths or reclining places beneath a seat, and a raised platform serving as a foot-stool to such seat, I claim a back to that seat capable of being moved, or of change of place, so that it may serve, at will, as a back or as a couch above the main seat. 3d, Making the top of the platform or foot-place pertaining to the main tier of seats movable, substantially in the manner specified. 4th, Arranging within a railroad car, long tudinal couches along or upon the floor, and other couches or seats above these, with backs, which may be converted into couches and passage ways, or a passage way, from which free access may be had to all the seats and couches. 5th, Combining with longitudinal passage ways or a longitudinal passage way, longitudinal seats, when those seats have backs so constructed that they may be converted into couches, or when those seats are free to slide transversely, substantially in the manner described. 6th, Adjustable or movable end seats, substantially such as described, and serving, if necessary, as steps, in combination with longitudinal car seats, having backs capable of conversion into couches.

242. APPARATUS FOR GENERATING ILLUMINATING GAS; Charles A. Tyler, Washington City, D. C.

Claim—1st, The peculiar arrangement and combination of the retort for generating the hydrogen gas with the main retort for the generation of the illuminating gas. 2d, Elongating and contracting the rear end of the main retort, in the manner set forth. 3d, Connecting the rear end of the hydrogen retort with the contracted end of the main retort, in the manner set forth.

243. BURNERS FOR VAPOR LAMPS; Sigourney Wales, Boston, Massachusetts.

Claim—When the wick is supported on and around an inner wick tube and within an outer wick tube, and the jet-cap is made separate from and so as to screw or fit on the outer wick tube, as described, the application of a rod to the movable jet-cap and the inner wick tube, in such manner as to be fastened to the cap and extend into and fit the bore of the tube, so as not only to enable the jet-cap to be raised and supported above the wick in manner to allow such wick to be inflamed, and the flame thereof to heat the said jet-cap and rod, but to serve as a means of conducting heat from the jet-cap into the inner tube, by which such heat may be conducted into the wick in order to aid in vaporizing the liquid contents thereof.

244. MAKING EDGE TOOLS; Wm. White, Newark, New Jersey.

Claim—The use of wrought iron and steel separately or combined, while in a melted or liquid state, for the purpose of forming into shape axes and other articles, without the process of forging, welding, or swaging, by the use of a mould, the cavity of which is the shape or form of the articles desired, as set forth.

245. LIFE-PRESERVING TRUNK; Oliver Evans Woods, Philadelphia, Pennsylvania.

Claim—A valise or trunk, made substantially as shown and described.

246. THE CUTTING APPARATUS OF HARVESTERS; Wm. A. Wood, Hoosick Falls, New York.

Claim—The manner described of constructing the guards and uniting them to the finger-bar.

247. DOOR FASTENER; Gilbert Yates, West Dresden, New York.

Claim—A door fastener constructed of the pieces, A A′ A″, bolt, keeper, and slot, operating as set forth.

248. TURNBUCKLE FOR WINDOW BLINDS; Joseph L., Assignor to self and George Chapman, Philadelphia, Pa.

Claim—The turnbuckle and sliding collar provided with the flanch and the spring, placed on the spindle or arbor, as set forth. Also, in combination with the above named parts, the washer placed on the arbor.

249. RAILROAD CAR SEATS; George L. Dulaney, Assignor to self and Solomon R. Moore, Mount Jackson, Va.

Claim—The combination and arrangement of the movable seat bottoms, hinged folding cushions, sliding slat blind frames, and hinged cushioned frames, and cushioned flaps on the backs of the seats and slides or panels.

250. Expanding Bit; Harley Stone, Assignor to Paul P. Todd, Blackstone, Massachusetts.

Claim—The mode and application of the slide cutter, the slits, the bolt, and the graduated scale, constructed as described.

251. Method of Blasting or Removing Submarine Bodies; Samuel Eakins, Assignor to self and M. S. Wickersham, Philadelphia, Pennsylvania.

Claim—The combination with a piece of ordnance to be employed under water for the removal of rocks or other bodies, by the operation described, of a series of adjustable legs, applied and operating substantially as and for the purpose specified.

[In this method of blasting or removing submarine bodies, a very heavy cannon, loaded with powder and ball is sunk with its muzzle in contact with, or as close as possible to the face of the rock or other body to be removed, and fired by a galvanic battery, to project the ball against the rock. The weight of the column of water above the cannon, added to the weight of the cannon itself prevents recoil, and causes the ball to be projected with immense force. The cannon has adjustable legs, which support it or attach it to the body to be removed, and enable it to be set at such angle as might be desirable to split off a ledge of rock. When the cannon has been fired, it is raised by chain tackles attached to it. Experiments show this to be a very effective method of blasting.]

252. Stacking Agricultural Products; Carlos W. Glover, Farm Ridge, Assignor to self, Bronson Murray, and J. Van Doren, La Salle Co., Illinois.

Claim—Making a stack out of two, three, four, or more lengths of straw, or other material, that overlap or break joint with each other, and which are laid with their seed ends pointing to a common centre, and commencing at the apex and ending at the base, and drawn together and secured substantially as represented, using as a foundation to build upon an apron or the binding cords or chains, as set forth.

253. Stacking Agricultural Products; John Van Doren, Farm Ridge, Assignor to self, Bronson Murray, and Carlos W. Glover, La Salle Co., Illinois.

Claim—The so placing of two, three, or more layers of stalks or straws in a box or former, that they shall break joint with each other, beginning at the apex and so continuing until one-half of the stack is formed, and then reversing the operation and laying them from the base to the apex for the other half of the stack, so that, when bound up, they shall form a stack shingled on its outside to protect the interior, substantially as described.

254. Cast Iron Mercury Bottle; Moses Wrangle, Assignor to Hunter, Keller & Co., City of New York.

Claim—Moulding iron mercury bottles with concave bottoms by means of the patterns, substantially as described.

Additional Improvements.

1. Rotary Pumps; Levi Burnell, Milwaukie, Wisconsin; patented August 31, 1858; additional dated December 14, 1858.

Claim—Operating three or more pairs of sliding valves in said pump, by means of the joint action of the rotary valves box, and the three-sided stationary cam, substantially as set forth.

2. Manufacture of Soap; Dalrymple Crawford, Toronto, Canada; patented March 13, 1858; additional dated December 14, 1858.

Claim—Using the refuse of Indian corn, and mixing it with a fat or oil and an alkali, and with or without resin, amalgamating the same to make soap. Also, subjecting the refuse of Indian corn to an alkali, with or without heat, and modifying the strength of the alkali when too strong and not required by an acid, and for the purpose of mixing it more easily with the soap.

3. Machinery for Dressing and Sizing Warps; Wm. Bradley, Manchester, Virginia; patented May 11, 1858; additional dated December 21, 1858.

Claim—The covering of the drying rollers with some non-conductor of heat, or material having less conductive properties than the material, to prevent the caking or uneven drying of the size in the warps.

4. Car Seats and Couches; A. M. Holmes, Assignor to self and A. G. Purdy, Morrisville, New York; patented December 6, 1858; additional dated December 21, 1858.

Claim—The use of the adjustable back-pad, or equivalent, and combined therewith the adjustable head rests.

Re-Issues.

1. Metallic Tips for Boots and Shoes; George A. Mitchell, Turner, Maine; patented January 5, 1858; re-issued December 7, 1858.

Claim—My described metallic tips, constructed in the manner set forth. Also, a metallic tipped boot or shoe, constructed essentially in the manner set forth.

2. Pistols and other Fire Arms; Ethan Allen, Worcester, Mass., formerly of Norwich Connecticut; patented April 16, 1845; re-issued December 14, 1858.

Claim—Extending the rear end of the dog or catch rearward and beyond where it is jointed to the tumbler of the percussion hammer, and connecting the upper end of the main spring directly to the part so extended, or otherwise connecting the main spring to the dog so as to cause it to operate upon the hammer, dog and trigger. Also, the arrangement of a mechanism in connexion with a self-cocking arrangement, whereby I am enabled to make the fire arm so as to be cocked at pleasure by the hammer, or to be operated entirely by the trigger, self-cocker, and mechanism consisting of the stud and the dog or catch, in connexion with the tumbler, or their equivalents, whereby the same results are obtained. Also, the piece of metal, as combined with or applied to the sere of the trigger, and in front of the notch thereof and hook of the catch, and operating in relation thereto, in the manner and for the purpose as explained. Also, my peculiar arrangement of the pitman upon the sere of the trigger, so as to operate, as above described, in combination with the construction and arrangement of the teeth upon the breech or rear end of the cylinder or series of barrels, by which improvement in constructing and arranging the aforesaid parts I am enabled to very much simplify them, in comparison with the manner in which they have been made and disposed.

3. Corn Planters; Nathaniel Drake, Newton, New Jersey; patented February 2, 1858; re-issued December 14, 1858.

Claim—1st, Operating the seed valves from the traction wheels by means of the rods or weights and cams, arranged as set forth. 2d, The agitator, arranged with relation to the seed boxes and valves, as set forth. 3d, The rib attached to the upper valve, constructed and operating as shown. 4th, Combining with one of the

weights which operate the valves, or its equivalent, a cam-shaped gear wheel corresponding in form with the cams which operate said weights. 5th, Extending the chains which operate the valves down under the pulleys back of the axle, so as to obviate the slackening and taking up of the chains by the vibrations of the ploughs and their attachment.

4. ORGANS; William Sumner, Worcester, Massachusetts; patented February 28, 1854; re-issued December 14, 1858.

Claim—The combination or arrangement and connexion with the keys, of a mechanism which shall enable the extreme key touched on either side, or both when operating itself, shall prevent all the others from operating in the stop or stops, connected therewith in the manner set forth. Also, controlling and operating the escape valve by means of friction on the arm, or its equivalent, in the manner set forth.

5. THE MANUFACTURE OF ELASTIC CLOTH; Horace H. Day, Assignee of Richard Solis, City of New York; patented November 7, 1849; re-issued December 14, 1858.

Claim—The new elastic cloth described, consisting of a woven textile material (or cloth), having the threads of the warp oblique to the weft, combined with gum elastic or india rubber, so that the two constitute an elastic compound fabric.

6. REAPING MACHINES; C. W. McCormick, Chicago, Illinois; patented October 23, 1847; re-issued May 24, 1853; re-re-issued December 21, 1858.

Claim—The combination of the support or stand for the raker, placed behind the axis of the reel, balanced or sustained with the raker thereon by the driving wheel, with the reel and with the short platform. Also, combining with the side draft reel reaping machine, having a reel for gathering the grain to the platform, a stand or seat for the raker fixed firmly upon the platform of the machine, so as to enable the raker securely to get at the grain as deposited on the platform by the reel, and deliver and lay it properly on the ground, from a single or short platform, out of the return track of the horses, in suitable gavels for being bound into sheaves. Also, the combination of the reel for gathering the grain to the cutting apparatus, and depositing it on the platform, with the stand or support for the raker, or the equivalent thereof, to enable him with ease and celerity regularly to remove the grain from the machine, and lay it on the ground out of the return track of the horses. Also, the construction of the stand or support for the raker, on the frame or platform of the machine, so that it gives to the raker such lateral and forward support to his body when standing at work that he may have free use of his arms and the upper part of his body to remove the cut grain from the platform, while at the same time he is so held fast that he cannot be thrown upon the reel, nor prevented from performing his functions by the jolting of the machine as it moves over the uneven ground.

7. SHEARS; Joseph A. Braden, La Grange, Georgia; patented September 21, 1858; re-issued Dec. 28, 1858.

Claim—The construction of scissors or shears with their blades in separate pieces from the handles, and fitted to the handles with stems and sockets.

8. LOOMS FOR WEAVING FIGURED FABRICS; George Crompton, Worcester, Mass.; patented Nov. 11, 1854; re-issued December 28, 1858.

Claim—Combining with hook jacks which are connected with the harness, and with the mechanism for operating them to open the shed, a pattern chain or cylinder constructed with two or more patterns, and operated so that either of the patterns can be made to act on the hook jacks to place them in the required position to be operated upon by the mechanism for operating the shed. Also, in combination with a pattern chain, arranged with two or more patterns in the direction of its length, the mechanism for changing the movements of the chain to effect the changing of the pattern. Also, placing two or more patterns upon the rods of a pattern chain side by side, and operating them in succession by vibrating the chain laterally. Also, pivoting the lifting and depressing rods at one end, the other being made adjustable. Also, moving the rods or jacks out of contact with the rollers on the pattern chain, before the chain is moved by means of what are termed the vibrating fingers, or the equivalents thereof.

9. STEAM STOVE; J. L. Sutton, Norristown, Pennsylvania; patented July 20, 1858; re-issued Dec. 28, 1858.

Claim—Combining two or more concentric chambers, connected together and arranged in respect to each other, with a boiler attached to an ordinary stove, for the purpose specified.

10. MACHINERY FOR CUTTING SCREWS; H. A. Harvey, Assignee (through mesne-assignment) of Thomas W. Harvey, late of City of New York; patented May 30, 1846; re-issued December 28, 1858.

Claim—1st, The combination and arrangement of two inclined rollers, one or both rotating, and placed at a sufficient distance apart to permit the shanks of the blanks to hang therein freely suspended by their heads, and for the purpose of arranging the blanks (when presented in a promiscuous mass) all in a row, with their heads up, and causing the row to travel to the lower end, and to be delivered one by one. 2d, Combining with the delivery end of the inclined rollers, or equivalent ways, for supplying the blanks in order, a delivery and check slide, and a receiving and conducting tube, or equivalent therefor, to receive the blanks from the row, deliver them one by one, and conduct them to the place where they are required for after operations, and at the periods required. 3d, Combining with the receiving and conducting tube, a transferer, or equivalent therefor, to receive the blanks from the conductor and transfer them to the mandrel or place where they are to be subjected to the cutting action. 4th, Combining with the mandrel or spindle, and with suitable means for holding the screw blanks in line, a sliding twin screw and spring, or equivalent therefor. 5th, Governing the motions of the chaser towards and from the axis of the blank, by combining the chaser with a carriage and sway bar moved by a cam, and also connecting one end of the sway bar with an adjusting slide, when this is combined with a chaser or chaser head, whereby the amount of taper to be given to the screw can be regulated at pleasure. 6th, Changing the directions of the various cam grooves by means of sliding switches, operated by sliding rods within the hollow cam shafts, and shifted by an index cam, by which the various changes of the motions of the machines are effected. And, finally, making the cam which operated the sway bar adjustable on its shaft, for the purpose of adjusting the motions of the chaser to the length of the blank, to insure the proper formation of the point of the screw.

11. GAS BURNERS; J. R. Foster, Boston, Mass., Assignee of A. H. Wood; patented September 21, 1858; re-issued December 28, 1858.

Claim—1st, The flame spreaders, consisting of the ring pieces extending outwardly from the gas orifice. 2d, The heaters, combined with the jet gas burners. 3d, Combining with the jet gas burner a draft cone, the top of which terminates at or near the level of the gas orifice.

DESIGNS.

1. METALLIC COFFIN; Wm. H Forbes, City of New York; dated December 7, 1558.

2. COOKS' STOVES; G. D. Sprecher, Lancaster, Pennsylvania; dated December 7, 1858.

3. PARLOR STOVES; Garrettson Smith and Henry Brown, Assignors to Leibrandt, McDowell & Co., Philadelphia, Pennsylvania; dated December 14, 1858.

4. COOKS' RANGES; Garrettson Smith and Henry Brown, Assignors to G. Abbott and A. Lawrence, Philadelphia, Pennsylvania; dated December 14, 1858.

5. BOOK MARKS; Wm. B. French, Charleston, Massachusetts; dated December 14, 1858.

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1. AUTOMATIC BOILER-FEEDER; Henry B. Adams, Brooklyn, New York.

Claim—The arrangement and combination of the chambers, shell, and adjustable weight. Also, the combination of the valves with the chambers, for the purposes described.

2. MANUFACTURE OF UMBRELLA RINGS; Jonathan Ball, Elmira, New York.

Claim—An umbrella ring having the ends of the ribs or the stretchers and the wire to confine them cast within.

3. GRINDING MILLS; Thomas Bennett, City of New York.

Claim—The adjustable conical shell, in combination with the grinding cone, placed or secured upon a shaft having no end play or longitudinal or adjusting movement. Further, in combination with the adjustable shell and cone, the cob-cutter permanently attached to the shaft, and having its shell fitted over the end of shell, for the purpose set forth.

4. ELASTIC SADDLES; Lewis Bishop, Talladega, Alabama.

Claim—A saddle having a seat suspended on springs, by means of loops and eyes, and otherwise made as described.

5. CORN SHELLERS; Michael Bomberger, Hummelstown, Pennsylvania.

Claim—So arranging the rollers (provided with helical springs), in combination with the loose rings, as to operate in the manner set forth. Also, the employment of the loose bar when arranged with rollers, helical springs, adjusting bars, and shelling cylinder, substantially as described.

6. HORSE RAKES; Wm. H. Brown, Middletown, New York.

Claim—The arrangement and combination of the segment rack, toothed sector and arm, rod, lever, and frame, as described.

7. HARVESTERS; A. C. Brownlick, Buffalo, New York.

Claim—The axle, in combination with the pinions, shaft, and pillow block, constructed substantially in the manner described.

8. SEED PLANTERS; Joel Bryant, Brooklyn, New York.

Claim—In connexion with the cultivating plough, the seed-planting apparatus consisting of the drill plough, seed box, seed slide, driving rod, covering wheel, and sod-clearer, substantially as described.

9. APPARATUS FOR HOISTING AND DUMPING COAL; W. B. Culver, Scranton, Pennsylvania.

Claim—The arrangement and combination of the rod, bars, bail, and inclined guides, as described.

10. ROCKING CHAIR; David Buzzell, Charlestown, Massachusetts.

Claim—In combination with the chair-stand or frame, the movable leg-rest, and the sliding foot applied to such leg-rest, a mechanism by which, when the leg-rest is moved or swung upon its fulcrum or bearings, the sliding foot-rest shall be moved on its supports either toward or away from the seat. Also, the combination of the foot levers and the rockers applied to the chair or seat frame, and so as to operate together. Also, the combination of the toggles, the lifting levers, and their connexions with the foot levers and rockers, the same being for the purpose of so operating the said rockers and levers as to cause the chair to be supported on the ground or floor either by the two rockers or the four foot levers. Also, so combining a foot-rest with a movable or turning leg-rest, that the former shall be movable relatively to the latter, as specified.

11. COTTON CULTIVATORS; Calvin Cannady, Indianapolis, Indiana.

Claim—1st, The two shares or blades when placed obliquely with each other, pivoted to their respective standards and adjusted by the rod, nut, and fork. 2d, The employment or use of the reciprocating hoe attached to the bar, which is connected with the rod, the hoe being operated through the medium of the cam, and spring, in connexion with the pin and springs, so that the transverse movement of the hoe relatively with the row of the plants will be obtained, and also of a vertical movement to allow the hoe to clear the plants when passing over them previous to each thinning out stroke. 3d, The lever, when applied to the rod and used in connexion with the thinning hoe, substantially as set forth.

12. CARPET FAN SWEEPER; Augustus C. Carey, Lynn, Massachusetts

Claim—The use of a fan for the purpose of sweeping the carpet or other surface, in place of the revolving brush heretofore employed for the purpose.

13. COOKING RANGE; Gardner Chilson, Boston, Massachusetts.

Claim—As my improved arrangement of flues against the bottoms, the outer sides, the tops, the inner sides, and in rear of the two ovens, whereby the smoke after passing over the tops of the two ovens, or either, is made to descend between them, and pass out into the back flue, in manner as described; and with the said arrangement of flues or the parts thereof to which the same specially belong, or in other words, the top and diving flues of the two ovens, I claim the arrangement and application of a curved valve and its arched recess. Also, the protector plate, as combined and arranged with reference to the fire-place, the two ovens, and the flue between the two ovens, and so as to support the ovens. Also, the described mode of making the upright flue leading from the fire-place or boiling chamber to the flue space about the oven such being made with a reflecting back and tapering sides, and in other respects substantially as specified. Also, the expansion safety plate as arranged with respect to the fire-place, and applied on the top plate of the boiling chamber, in the manner specified.

14. SMUT MACHINES; Everard M. Clark, Lancaster, Pennsylvania.

Claim—The diagonal grooved wings or beaters, the upper and lower grooved wings or beaters, the two sliding valves on the bottom of the machine, for regulating the draft, when combined substantially as set forth.

15. BILLIARD CUE TIPS; H. W. Collender, City of New York.

Claim—A cue leather or cue tip, coated on its flat surface with a soluble gum or cement, as described.

16. CONSTRUCTION OF SPECTACLES; John Burt, Hartford, Connecticut, and William W. Willard, Syracuse, New York.

Claim—The employment of the link joint to the nose piece. Also, the construction and arrangement of the short bows, springs, cup, or pads, substantially in the manner described.

17. BANDBOXES; George H. Dickerman, Boston, Massachusetts.

Claim—The combination of a removable standard with the paper bandbox, arranged substantially in the manner described.

18. CULTIVATORS; John B. Duane, Schenectady, New York.

Claim—The arrangement and combination of the frame, D, having wheels, g, bar, F, wheel, G, bar, E, and frame, A, as described.

19. ESCAPEMENT FOR TIME-KEEPERS; John W. Einhaus, City of New York.

Claim—The use of a triangular-shaped pallet lever for an escapement pallet for clocks, watches, &c., with an escapement wheel, constructed in the manner set forth—but irrespective of such use of my block pallet, I make no claim to the construction of the escapement wheel of itself, as my invention relates exclusively to the use and application of the block pallet.

20. SPADING MACHINES; George B. Field, St. Louis, Missouri.

Claim—Propelling the shovels by means of single cranks attached to handles, and guided by adjustable arms or levers, so that the lower end of the shovels, when in motion, shall run in separate lines or furrows, substantially as described.

21. WASHING MACHINES; Micah Gillam, Alba, Pennsylvania.

Claim—The beaters or lifters arranged upon the rocker shaft within the half cylindrical tub, lined with anti-friction rollers, the rocker shaft being operated by the lever, vertical shaft, and connecting rods.

22. MEANS OF OPERATING CARRIAGE BRAKES; Wm. Gourley and Isaac Krebs, Winchester, Virginia.

Claim—The construction and application of the compound or double lever, and the crank-shaped rubber rod or brake bar, and T-shaped spring, when combined and operated substantially as described.

23. MACHINE FOR SAWING LATHS; E. H. Hancock, Augusta, Georgia.

Claim—1st, The combination of the peculiar spirally-toothed feed rollers, G G′, ordinary toothed or fluted feed rollers, H H′, and obliquely set guide or gauge, when arranged relatively to the saws, for the purposes set forth. 2d, The combination of the rollers, G′ H, swinging frames, shaft, pinions, spur-wheel, and cog-wheel, substantially as set forth. 3d, The arrangement of the swing table bearing a portion of the machinery with respect to the frame, and the rest of the machinery thereon, as set forth.

24. BEE-HIVES; J. S. Harbison, Sacramento, California.

Claim—1st, The graduating chamber, in combination with the curtain and ventilating passages, whereby air is admitted without light into the hive. 2d, Providing the adjustable sectional comb frames with the flexible metal clamps, when the frames are constructed and arranged in the manner described. While not claiming, broadly, the removal of a tier of boxes at one operation, nor the boxes of a tier separately, by means of a clamp, irrespective of the mode of construction, I do claim:—3d, The device composed of the parts, L f d c, in combination with a horizontal tier of boxes, arranged and operated as described.

25. COFFEE POTS; J. W. Hedenberg, St. Louis, Missouri.

Claim—The application of the chimney or pipe to the open space between the coffee pot and the condenser, for the purpose of causing a current of cold air to pass between the coffee pot and condenser, as set forth.

26. ROTARY HARROWS; Charles Howell, Cleveland, Ohio.

Claim—1st, The arrangement and combination of three rotary harrows, when the axis of each is inclined, in the manner described. 2d, The arrangement of the hook in relation to the front harrow, when combined with two harrows in the rear, arranged to operate in the manner set forth.

27. METHOD OF OPERATING THE VALVES OF PUMPING ENGINES; L. J. Knowles, Warren, Massachusetts.

Claim—1st, Controlling the motions and positions of the plunger exclusively by steam admitted from the steam chest, and by suitable exhausts. 2d, The described arrangement of the induction ports with respect to the exhaust ports, and with respect to the throw of the plunger, for the purpose specified. 3d, Admitting a quantity of steam before the advancing plunger through the passages, for the purpose of arresting its motion. 4th, The secondary exhaust ports, operating as described. 5th, The peculiar construction of the main valve, whereby the pressure upon the same is relieved, as it passes the centre of its throw, and the piston is caused to start more gradually, as set forth.

28. MEANS OF OPERATING CARRIAGE BRAKES; Isaac Krebs, Winchester, Virginia.

Claim—The levers with movable fulcrum, the sliding adjusting connexion rod and tap, the slotted clip or fulcrum support, and the spring rubber, when constructed as described.

29. MACHINES FOR SOWING GUANO AND OTHER FERTILIZERS; J. H. Leach, Oakville, Maryland.

Claim—The arrangement of the covering section of the drill within the frame of the roller section—and in connexion therewith, the arrangement of the box between the hopper and distributing spout, the box being attached to the hopper by pliable or elastic material, and being vibrated with the spout by the toothed wheel upon the axle, as described.

30. RAILROAD SLEEPING CARS; T. Luce and J. H. Morrison, Detroit, Michigan.

Claim—The folding berth bottoms attached at each side of a central partition within the body of the car, in connexion with the double row of single seats at each side of the car, with a passage way between them, the innermost row of seats at each side of the car being provided with falling backs.

31. RAILWAY ALARM; Henry Maule, Philadelphia, Pennsylvania.

Claim—The employment of the lever, or its equivalent, in combination with an extra rail and with the steam whistle, substantially as described, for sounding the steam whistle at any desired part of the road.

32. CUTTING AND PUNCHING IRON; A. J. Peavey, South Montville, Maine.

Claim—The cylindrical die-box, in combination with the circular punch socket, both punch and die being by their means capable of revolution upon their axes and adjustment to the required angles of the teeth of the saw to be gummed. I do not claim the dividing plate and the parts necessary for its convenient operation,

nor operating the punches by lever and cam, separately considered. But I do claim the combination of the dividing plate and its appendages, with the punching apparatus, in the manner and for the purpose specified.

33. Spoke Machine; N. Olney and C. H. Kellogg, Amherst, Massachusetts.

Claim—The expanding cutter heads in connexion with the guides or patterns attached to the reciprocating carriage, in which the stick to be operated upon is placed; the guides or patterns actuating the cutter heads respectively by means of the mechanism. Further, in combination with the expanding cutter heads, and the guides or patterns on the carriage, the circular saws fitted in the frame, operated automatically by the carriage, substantially as set forth.

34. Corn Harvesters; R. C. Mauck, Conrad's Store, Virginia.

Claim—1st, The bearing wheel, arranged substantially as set forth. 2d, The combination of the bearing wheel and the rest block for submitting the stalk to the knife in the best manner to effect the cut. 3d, Guiding the machine by the passage of the groove over the stumps of the cut products.

35. Revolving Fire Arms; C. S. Pettengill, New Haven, Connecticut.

Claim—1st, Combining the hammer and the rotating dog with the trigger, by means of a forked tumbler and a cam working on the same pin, the said cam being formed with a notched tail to engage and operate in combination with a horn on the trigger, substantially as set forth 2d, The bent dog, applied as described, on a fixed conical steed on the centre of the rear of the breech, supported and combined with a cam on the tumbler pin, to operate substantially as described. 3d, The arrangement of the helical main spring upon a bolt which is jointed to the hammer, and which slides through a fixed guide in the rear thereof, substantially as described.

36. Machine for Ditching, Grading, &c.; Wm. Provines, Columbia, Missouri.

Claim—The arrangement and combination of the elevators, rods, shaft, f, disk, and shaft, G, substantially as described.

37. Machinery for Pointing the Teeth of Hair Combs; C. B. Rogers, Deep River, Connecticut.

Claim—Forming the recesses at the centre and from the edges of the periphery of the wheel toward its centre, so that each recess shall extend only partially across the periphery of the wheel, and still cutting surfaces be formed entirely across it, without breaking or dividing the screw-thread entirely across the wheel at any one point, substantially as set forth.

38. Sifting Shovels; Paul A. Sabbaton, Albany, New York.

Claim—A screening shovel, composed of malleable cast iron, and otherwise made as described.

39. Grinding and Crushing Mills; Gelsten Sanford, Poughkeepsie, New York.

Claim—1st, The arrangement and combination of a conical grinding surface with a concentric shell, composed of stationary and adjustable wedges or staves, which are provided with a means of adjustment, substantially as described. 2d, The arrangement of the projecting surfaces of the cone, so that by reversing the direction of the rotation of the cone, small or large bodies may be crushed and ground in the mill.

40. Lamps; Wm. F. Shaw, Boston, Massachusetts.

Claim—The foraminous deflector described, operating in the manner set forth. Also, the foraminous deflector, in combination with the perforated bottom air chamber, as set forth.

41. Sewing Machines; Isaac M. Singer, City of New York.

Claim—Placing the spool within the shuttle without any attachment, so that the heads thereof shall run in contact with the case of the shuttle, to give the required drag. Also, in combination with the shuttle case, and the spool placed therein without any connexion, the employment of the spring plates to form spring bearings for the pivots of the spool, as set forth. Also, the shuttle case and spool placed therein without any attachment, in combination with the enclosing plate and the face of the shuttle race, by means of which combination the spool is held in place by simply placing the shuttle in its race.

42. Franklin Stoves; David Stuart, Philadelphia, Pennsylvania.

Claim—Forming the fire back of such stoves by the front wall of a cell or chamber, around or on both sides of which the draft passes, and through which the air circulates, said cell or chamber being constructed and connected with the stove in the manner set forth.

43. Lithographic Printing Press; Wm. Hermann Stuble, Boston, Massachusetts.

Claim—1st, The cylinder of rollers, in combination with a revolving tympan and scraper, operating as set forth. 2d, The method of interrupting the motion of the gears and of again engaging them with the rack, by means of cams, lever, and pin, operating in the manner set forth. 3d, Hanging the parts which operate the scraper on springs, in the manner specified.

44. Cultivators; George W. Tolhurst, Liverpool, Ohio.

Claim—The arrangement of the flanched quadrants, pivots, clamp hook, braces, teeth, and rigid frame, in the manner described.

45. Catch for Hanging Drapery; Alonzo and Cyrus A. Warner, Bristol, Connecticut.

Claim—The spring catch, constructed as specified.

46. Mode of Operating Drain Ploughs; Daniel Watson, Newport, Ohio.

Claim—Combining with the crab or anchor and the plough, traveling capstans, which are connected together by a rope or chain, as represented, for the purpose of working said plough.

47. Corn Sheller; Wm. Wells, Boston, Massachusetts.

Claim—The arrangement and combination of the shelling wheel, guide, clearer, and weighted or spring presser, constructed in the manner described.

48. Copying Press; Alonzo Whitcomb, Worcester, Massachusetts.

Claim—When the screw is arranged to pass through and traverse a nut in the cross-bar, I claim connecting the screw and platen with each other in presses, by means of a cap on the upper side of the platen, with a spiral thread in its interior to correspond with the thread on the lower end of the screw, as described.

49. Screw Propeller; Benjamin F. Bee, Harwich, Assignor to self and James A. Woodbury, Boston, Mass.

Claim—The combination of the cylinder with the longitudinal plates, as described.

50. Horse Rakes; B. Bridendolph, Assignor to self and O. K. Borey, Clear Spring, Maryland.

Claim—The arrangement of the handles, rake head, shafts, runners, and links or rods, for the purpose set forth.

51. Attaching Handles to Cutlery; Matthew Chapman, Assignor to the J. Russell Manufacturing Co., Greenfield, Massachusetts.

Claim—Placing the handles in the rough on the tangs of the implements, with or without the rivets, and compressing the same while on the tangs into proper form by means of dies, as set forth.

52. Manufacturing Webbing; James C. Cooke, Assignor to the Russell Manufacturing Company, Middleton, Connecticut.

Claim—A fabric or belting made not only of two or more sets of body warps, and a single filling thread passed through the decussations of the said warps, alternately or otherwise, but with confining warps arranged and crossed on the filling, and between the body warps and at various or numerous intervals between the two edges of the fabric, so as to bind together the cloths made by the body warps, and form them with no straight or continuous parallel ridges.

53. Method of Bending Wood; Robert Fitts, New Ipswich, New Hampshire, Assignor to C. and G. C. Winchester, Ashburnham, Massachusetts.

Claim—Bending a piece of wood around a fixed form, by means of the series of blocks, levers, and connecting bars. Also, in combination with the above, the spring face plate attached to the blocks, in the manner specified.

54. Bridge Walls in Boiler Furnaces; Wm. G. Hamilton, Assignor to John C. Hamilton, City of New York.

Claim—The hanging of the bridge wall upon an axis, in the manner described, or equivalent, by which it is made capable of being folded down out of the way, and also the making of the axis hollow, terminating with an opening forward, as described.

55. Electro-magnetic Telegraphing; David E. Hughes, Assignor to the American Telegraph Company, City of New York.

Claim—Introducing into that portion of the electric current which passes to the opposite pole of the machine, at the station where the operator is working, a retarder, such substantially as herein described, whereby said portion shall not reach the near ground plate until after the other portion of the same current shall have passed over the line wire and reached the distant ground plate, whereby said current is enabled to flow through the machine situated at the place of the operator, as aforesaid, without setting said machine in motion, substantially as described.

56. Manufacturing Corsets and Bustles; Damase Lamoureux, Assignor to Alexander Douglas and Samuel S. Sherwood, City of New York.

Claim—A corset and bustle, when constructed in the manner described.

57. Looms; Stephen C. Mendenhall, Assignor to Isaac Lamb, Richmond, Indiana.

Claim—1st, The treadle roller, carrier, and spring, in combination with the scroll cam, arranged in the box, for the purpose of operating the treadles substantially in the manner described. 2d, The hook having an adjustable and hinged attachment to the breast-beam, when combined with a set-screw to determine its position, and operating in the scroll cam, in the manner set forth. 3d, The combination with the treadle of the graduated series of mortises and pin, for the purpose of regulating the width of the shed. 4th, The combination of the picker spring, sliding catches, triggers, and straps, for the purpose of throwing the shuttle, as set forth. 5th, The combination of the double eccentric pulley and straps with the set-screws, for the purpose of expanding the picker spring in such a manner as to equalize the power at each forward motion of the lay or batten.

58. Lasts; Goodloe H. Taylor, Shelburne, Assignor to self and Wm. Sherwin, Shelburne Falls, Mass.

Claim—So pivoting the hook or lever as that the strain shall come upon said pivot and not upon the spring, by which means I effect a better and more certain fastening.

59. Sealing Cans and Bottles; James D. Willoughby, Carlisle, Pennsylvania, Assignor to C. M. Alexander, Washington City, D. C.

Claim—1st, The arrangement of the disks, screw, and top with the rubber, in such a manner that when the rubber is compressed its periphery will press tightly against the insides of the can or bottle mouth, while its centre presses against the rod or screw, for the purpose of effectually excluding the air. 2d, The subject of the first claim in combination with the neck of the bottle or can, as constructed.

60. Burners for Vapor Lamps; Ephraim D. Rosencrantz and Willard H. Smith, Assignors to said Rosencrantz and Barton E. Clark, City of New York.

Claim—The employment of a tube for holding the wick, when provided with a plate and perforations, for the purpose set forth. Also, the employment of a cap or heater having perforations tangential to its periphery, when used with a wick tube, in the manner set forth.

61. Coffins; Charles E. H. Richardson, Philadelphia, Pennsylvania.

Claim—The construction of a coffin or casket, made air and moisture tight by a double lining of cloth and cork, prepared and combined in the manner described.

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62. Composition for Friction Matches; Wm. Paggett Allen, Dubuque, Iowa.

Claim—1st, The combination of phosphorus with the substances marked, B and C, in the proportions and manner set forth. 2d, The combination of phosphorus with the substances marked D and E, in the said proportions and manner. 3d, The combination of phosphorus with the substances marked A, in said proportion and manner.

63. Roller for Expressing Water from Clothes; John Allender, New London, Connecticut.

Claim—A roller consisting of a spirally coiled spring, arranged on a shaft or roller made smallest in the middle (to allow the spring to yield), covered with india rubber, or some flexible material, that will yield or bend readily as the spring yields to the cloth, clothes, or other article being squeezed by the rollers.

64. Door Spring; James Barkley, Weston, Missouri.

Claim—The employment of the spring which shall be provided with a hook at one end, and which shall be secured to the casing at the other by means of two half staples, thus making a spring, which is adjustable to both ends, capable of being detached from either the door or casing in a moment of time.

65. Canteens; Benjamin Beers, New Fairfield, Connecticut.

Claim—The combination with said canteen, of the additional vessel made by hollowing out a piece of wood and inserting its edge in a groove in the end or head.

66. Method of Securing together the Sides of Cast Metal Columns; A. J. Bowers, Richmond, Virginia.

Claim—Securing the plates or sides of metal columns together by means of the projections, ledge provided with notches, and the wedges, as described.

67. Water-closet; Thomas Birch and Lewis Bradley, Hartford, Connecticut.

Claim—The arrangement of the metallic rim, arm, disk, cap, and lever, in the manner described.

68. Artificial Manure; Duncan Bruce, Paspebiac, Canada.

Claim—The manure manufactured by the described process, the animal matters being first decomposed in the manner set forth, and subsequently disinfected by charred shale, or its equivalent.

69. School Desk and Chair Combined; George Buchanan, Hickory, Pennsylvania.

Claim—A seat pivoted near its front edge to a stationary frame, and hinged near its near edge to a movable back, and having its arms pivoted by their rear ends to the movable back, and hinged to the stationary frame.

70. Devices for Setting Laterally Circular Saws; J. D. C. Carpenter, Cincinnati, Ohio.

Claim—The rock shaft connected with arms and acting as an eccentric or as two cranks for adjusting the saw shaft laterally.

71. Burglar-proof Safe; John B. Cornell, City of New York.

Claim—Combining a cast iron door frame with the wrought iron portions of the frame of a safe, in such a manner that the molten iron, which is afterward, whilst in a melted state, combined with the said safe frame will form a burglar-proof protecting casing around the said door frame.

72. Lathe Attachment for Finishing Dental Plates; Elijah H. Danforth, Jamestown, New York.

Claim—The combination of the mechanical devices specified, consisting of the piston, bed-pieces, boxes, slides, and the crank. Also, the adjustable crank as it is arranged and attached to the specified parts of this machine, as set forth.

73. Soda Water Apparatus; Thomas Daniels, Toledo, Ohio.

Claim—1st, The arrangement of the whole apparatus, the syrup cans being elevated above the refrigerator, which is provided with the group stop cock. 2d, The arrangement of the tubes for conducting the syrups and the water to the top of the ice chamber, without cooling them, and concentrating the cooler portions of these liquids below the ice near the place of discharge.

74. Method of Securing the Cylindrical Balance Springs of Watches; A. L. Dennison, Waltham, Mass.

Claim—Placing the cylindrical spring beneath the balance and between it and the fork, and cutting away the upper plate to furnish room for its accommodation.

75. Lewis for Attaching Tackles to Blocks of Stone; Eugene Duchamp, St. Martinsville, Louisiana.

Claim—A lewis composed of a shell, air pump, nozzle or tube, packing, staple, and otherwise made as described.

76. Endless Conveyors for Removing Earth; Samuel Falwell, Memphis, Tennessee.

Claim—1st, The series of sectional cars in an endless connexion, each car being provided with terminal or track wheels, and intermediate wheels of varying and lesser diameter than the track wheels and shoulder stops, or equivalents thereof. 2d, The combination of such cars with an upper and lower track and wheels, as set forth.

77. Electro-magnetic Fire Alarm Apparatus; Moses G. Farmer, Salem, Massachusetts.

Claim—The circuit wheel and the crank or handle by which it is actuated, in combination with the key and the electro-magnetic circuit, operating to send a definite signal from a sub-district to the central station. Also, the method of completing the circuit, when the door of the signal-box is closed, through the springs, as set forth.

78. Door Spring; John S. Gray, City of New York.

Claim—The combination of the socket, bolt, and hold-fast, with the torsion spring, constructed as set forth.

79. Washing Machine; J. R. and J. S. Haldeman, Bloomington, Illinois.

Claim—1st, The arrangement of the springs and supporting beams, in connexion with the sliding frame that carries the lower series of fluted rolls. 2d, The clasp, constructed as set forth. 3d, The sliding standard, or its equivalent, in combination with the rack bar and pawl, as set forth.

80. Washing Machine; Eden S. Howell, Hope, New Jersey.

Claim—1st, The combination of the live rubber with the horizontal sliding and rotating shaft, vibrating pressing lever, and ratchet, or its equivalent. 2d, In combination with the rocking and pressing rubber, the perforated rubber partition. 3d, The detachable lever and bar, substantially as described.

81. Flail Caps; Thomas J. Hubbard, Hamilton, New York.

Claim—The construction of flail caps, of casting metals in separate parts or sections, with the lip or crescent tongue formed upon the interior thereon, as described.

82. Preparation of Resins; Edward Hunt and Henry Davis Pochin, Talford, England; patented in England, April 27, 1858.

We are aware that stills and steam worms, capable of distributing small jets of steam, have been before used in a somewhat similar way for the treatment of oils and fatty matters, and for improving the quality of resin oil obtained from substances similar to those used by us in the processes described But such a process has never, so far as we can ascertain, been applied to any such substances as are proposed to be operated upon by our processes, for the purposes of obtaining the resinous and solid products specified as the result of our said processes We therefore

Claim—The new article of commerce specified, as produced by the processes mentioned, or by any similar mode or process, said articles or products not having been hitherto known in commerce or used in the arts.

83. SAUSAGE STUFFER; R. V. Jones, Johnstown, Pennsylvania.

Claim—The piston rod and supporting recess, constructed as described, in combination with the pronged nut and screw.

84. TREATMENT OF INDIA RUBBER; Henry W. Joslin, Trenton, New Jersey.

Claim—The use and employment of sulphuret of zinc, either artificial or native, substantially prepared by the aforesaid process described, in combination with india rubber, for the purpose of curing or vulcanizing it in form and manner as set forth, without the use of free sulphur in any way in combination with the rubber.

85. STUMP EXTRACTORS; John L. Knowlton, Glassborough, New Jersey.

Claim—The lever with its catches, in combination with the hauling chain and springs, or their equivalents, when the said chain is guided so as to prevent it from twisting or from moving laterally or vertically.

86. HORSE COLLARS; Oliver Lapreniere, City of New York.

Claim—A horse collar, having its lower part provided with a metallic tube, to give form to and hold the packing.

87. ROOFING COMPOSITIONS; Henry Lester, Cincinnati, Ohio.

Claim—A composition for roofing, and similar purposes, produced from the mixture of the ingredients described, in the proportions and for the purposes set forth.

88. TAPER GAUGE FOR CARPENTERS; John Marvin, Bellport, New York.

Claim—The employment and use of a conical roller applied to a block or a stock of the gauge, and connected with a rack or the pencil bar, in the manner shown, or in any equivalent way, so that the roller will be rotated as the gauge is shoved along. and the bar moved longitudinally by the rotation of the roller, so as to produce the desired result. Further, in combination with the conical roller, the adjustable band and fence, applied to the block or stock, for the purpose of regulating the degree of taper of the line, substantially as described.

89. METALLIC CARTRIDGE CASES; Edward Maynard, Washington City, D. C.

Claim—An improved metallic cartridge, composed of a brass cup combined with an exterior steel disk, substantially as set forth.

90. INDIA RUBBER HOSE PIPES; Charles McBurney, Roxbury, Massachusetts.

Claim—A semi-elastic composition pipe, compounded of the ingredients and in the proportions substantially specified, when vulcanized, as set forth.

91. MACHINE FOR SAWING SHINGLES FROM THE BOLT; Alex. R. McCans, Ashley, Missouri.

Claim—In combination with a saw hung in a swinging arm, the spur, rack, and sliding bar, for drawing said saw through the bolt, to sever the shingle therefrom, and to trip and allow the saw to fall back for the next similar operation. Also, in combination with a pivoted table for holding the bolt. the shifting bars, for bringing the bolt up to the saw in such a manner as to alternately reverse the ends of said bolt, from which the butts and points of the shingles are cut, as set forth.

92. RAILROAD CAR SEATS; Thomas E. McNeill, Philadelphia, Pennsylvania.

Claim—1st, Jointing the ends of the arm-rests to the ends of the upright standards at the corners of the seats, and providing their opposite ends with sliding bolts or bars, and right-angled plates. and half pivots or pins for enabling their attachment, when in a horizontal position, by the bars and their upright elevation, to form a support for the hinged portions of the backs, when the seats are swung round upon the crank bars. 2d, The combination of the hinged board, with the projecting ledges on its surface, with the box-like frame forming the rest of the bottom of the seat, next the end of the car in which it can be enclosed. 3d, In combination with the swinging seats, the box-like frames and the platforms, attached to the same by the cranks and jointed bars.

93. STONE-CUTTING MACHINES; George Morgan, Brooklyn, New York.

Claim—The arrangement of cutters of gradually increasing length, in such relation to hammers and to a sliding carriage, that by the action of the hammers on the cutters an incision is made through the whole length of a block of stone, which is placed on the carriage.

94. APPARATUS FOR INCREASING DRAFT OF CHIMNEYS; Antoine Niel, Brooklyn, New York.

Claim—The arrangement of the exterior tube, having the expanded conical and cylindrical portions constituting the chamber of compression, and the contracted annular space between the two tubes above the conical part of the tube with the inner tube, the two tubes bearing the relation to each other as herein set forth.

95. BRIDLE BITS; Antoine Niel, Brooklyn, New York.

Claim—1st, The combination of the griper bars with the bars of the bit of the horse. 2d, Attaching the griping bars by their double-eyed ends and by the screw nuts to the bars, as set forth.

96. SPECTACLE FRAMES; Theodore Noel, Memphis, Tennessee.

Claim—The employment of springs applied to the frame, as specified.

97. RETORTS FOR DISTILLING OIL FROM COAL; James O'Hara, Pittsburgh, Pennsylvania.

Claim—The employment in an upright retort for distilling coal, of a revolving screw, of a circumference smaller than the interior of the retort, so applied that while by its revolution it produces a continuous elevation of the central portion of the charge, it permits and causes a continuous descent of the surrounding portion by gravitation, and thus produces a positive continuous and uninterrupted upward and downward circulation.

98. GAS BURNERS; Albert Ostrander, City of New York.

Claim—The manufacture of gas burners, made of the composition of felspar, quartz, and asbestos, having the peculiar formation of the vents set forth.

99. ARTIFICIAL FORE ARMS; B. Frank Palmer, Philadelphia, Pennsylvania.

Claim—1st, Closing the hand by means of a strap, operated by an attachment to the shoulder of the opposite arm. 2d, The clamp, constructed and operating as described, and applied to the purpose specified.

100. MANUFACTURE OF SUGAR; Edmond Pesier, Valenciennes, France; patented in France, March 29, 1858.

Claim—The treatment of the saccharine juices of plants, in the manner described, by the use of alcohol, in combination with other special agents.

101. Artificial Arm and Hand; B. Frank Palmer, Philadelphia, Pennsylvania.

Claim—1st, Giving a sinuous course to the flex or tendons of the fingers, by means of the sheaves, for the purpose described. 2d, Opening the fingers by means of extensor tendons, antagonizing the flexors by means of springs. 3d, The wrist-joint, constructed as described, of a ball and socket held in contact by cords arranged and operating as specified. 4th, Giving a soft and elastic covering to the shaft and the wrist, for the purpose of imitating the changes of form which take place in the natural arm, during the movements of the radius and the play of the pronator and supinator muscles. 5th, The mode described of attaching the arm to the body.

102. Peg Cutters; E. R. Pease and R. R. Hayman, Poughkeepsie, New York.

Claim—The described machine for cutting off or removing pegs and nails from the insides of boots and shoes.

103. Inkstand; G. M. Prentiss, Worcester, Massachusetts.

Claim—An inkstand, having a plunger, constructed and fitted as described.

104. Corn Harvesters; Isaac Reamer, Conrad's Store, Virginia.

Claim—1st, The combination of the elastic lower guide with the adjustable upper guide, when these parts are arranged in the manner described. 2d, The arrangement and combination of guide and swinging clearer for removing the corn from the platform, in the manner described.

105. Detaching Paper from Vulcanized Gum; Albert C. Richard, Newtown, Connecticut.

Claim—Subjecting the surface or surfaces of vulcanized india rubber, gutta-percha, or other elastic gum, sheets, valves, belts, or other objects, which have been so vulcanized or cured between or on paper, and to which the paper adheres, to a mechanical process of regular bending and continual elongation, having the continuous effect of drawing or detaching the filaments or atoms of the elastic gum, which adhere to, or which have entered into the pores of the paper, gradually and regularly therefrom and thereout, simultaneously across the whole width of the surface operated upon, in the manner as set forth, or in any other manner producing substantially the same result.

106. Framing Square; Wm. Ripley, Edgartown, Massachusetts.

Claim—Framing square made with its bearing ledge, its squaring arms, mitre slots, and mortising slots, arranged together and with respect to a base rule.

107. Machinery for Oiling the Journals of Locomotives; Stephen Scotton, Richmond, Indiana.

Claim—1st, The combination of the weighted shaft, the spiral spring, and the box, with the journal of locomotive carriage. 2d, The metal cup, in combination with the box and upright shaft, or their equivalents. 3d, The nut, when combined with the upright shaft and cup, or their equivalents, in the manner specified.

108. Treating Auriferous and Argentiferous Pyrites; Lewis Solomon, City of New York.

Claim—1st, Extracting gold and silver from auriferous and argentiferous pyrites, in the manner substantially as set forth. 2d. The application of wood ashes to the roasted ore during the process of grinding, and of soda ash, for the purposes specified.

109. Grinding Surfaces for Mills; O. W. Stanford, Cincinnati, Ohio.

Claim—The employment of a system of circular grinding teeth, when arranged in the manner set forth. Also, arranging around the outer surface of the disk intercepting V-shaped teeth, to operate in the manner specified.

110. Trip Hammers; Casper V. Statter and George W. Wilson, Walnut Grove, Illinois.

Claim—Arranging a hammer in such relation to an anvil, by means of levers and links, that the same can be operated by means of a hand lever or by foot levers. Also, the arrangement of the hand lever in such relation to the foot levers and to the chisel, that both the hammer and the chisel may be operated by the motion of the hand lever. And in combination with the above described hammer, we further claim connecting the handle of the chisel with the arm, by means of an adjustable rod, so that the cutting edge of the chisel may be accommodated to different thicknesses of iron.

111. Desiccating and Clarifying Cane Juice; Richard A. Stewart, St. Bernard's Parish, Louisiana.

Claim—As new in the desiccation and clarification of cane juice, and other liquid or semi-liquid forms of saccharine matter, disseminating throughout the same sulphurous gas, or sulphurous acid gas, for the purposes set forth.

112. Gas Retorts; H. K. Symmes, Newton, Massachusetts.

Claim—Dispensing with the mouth-piece of the ordinary horizontal gas generating retort, and dividing the mouth of the retort into two portions, one of which is brought into permanent connexion with the stand pipe, the other being employed for the purpose of charging the retort.

113. Manufacture of Candles; Joel H. Tatum, City of New York.

Claim—A candle, having its stock composed of tallow, stearic acid, and gum camphor, with or without bees-wax, in about the proportion specified, and the exterior of the candle covered with a compound composed of stearic acid, gum camphor, and gum damar, or equivalent flux, in about the proportions set forth.

114. Mode of Constructing Slats for Blinds; Wm. E. Worthen and John J. Althause, City of New York.

Claim—A sheet metal blind slat or luffer board, made up of the combination of a slit tube, with two thicknesses of sheet metal.

115. Hardening Fatty Substances; Benjamin C. Tilghman, Philadelphia, Pennsylvania; patented in England, May 2, 1857.

I do not claim, generally, the process of hardening fatty substances by sulphuric acid, as I am aware that this has been before proposed: but in such cases, the heat employed has been under or above 212° Fah. Now, I have found that the hardening effect of sulphurous acid is very greatly increased by causing it to act upon the fatty substances at more elevated temperatures, preferring from about 350° to 550° Fah., but which may be varied from a little above 212° Fah., to above the distilling point of the fatty substance, and it is to this modification of the process that the part of my claim extends and is confined. I am also aware that it has been before proposed to decompose fatty substances and soaps into fat acids, and to purify fatty substances from mucilage, gelatine, &c., by means of sulphurous acid, and also to subject fatty substances to the action of strong sulphuric acid, whereby sulphurous acid is generated in the fat itself—and I wish it to be understood that I make no claim to any of the above processes.

Claim—The hardening of acid and neutral fatty substances, by subjecting them to the action of sul-

phurous acid at elevated temperatures, either with or without pressure. Also, the use of oxide of copper, or its chemical substitutes, to remove from fat acids the sulphureted impurity produced therein, by treatment with sulphurous acid. Also, the methods of preserving the color of white neutral fats, when treated by sulphurous acid at elevated temperatures, by using the sulphurous acid entirely free from air or oxygen, and by using fats pure and neutral, and free from any mixture of acid, rancid, or decomposed fats.

116. Temples for Looms; Jeremiah C. Tilton, Sanbornton Bridge, New Hampshire.

Claim—The application of the cloth bearer carrier to its support by a hinge, arranged in manner substantially as described, that is, so as to allow the carrier and its bearer to be drawn backward under circumstances as described.

117. Corn Shellers; Artemas B. Vant and Arlon M. Cook, Milford, Massachusetts.

Claim—The combination and arrangement of the smooth revolving pressure plate or wheel, with the convex toothed wheel and guard plates, when constructed substantially in the manner described.

118. Hydrofuze Fabrics; James Wansborough, Southwark, County of Surrey, England, patented in England, December 13, 1853.

Claim—Securing the flocks, or other finely divided substance, after it has been sifted or spread on to the surface and calendered by applying to the surface thereof a solution of india rubber or allied gum. Also, in combination with the method of securing the flock described, the subjecting of the same to a steaming process.

119. Locomotive Engines; Ross Winans, Baltimore, Maryland.

Claim—The blast equalizing pipe proportioned to the chimney, and arranged substantially as set forth. Likewise, a blast pipe of less diameter than the smoke pipe, and having a bell mouth, in combination with an exhaust nozzle and the bottom on which the sparks lie.

120. Surveying Instrument; George Windle, Edenburgh, Virginia.

Claim—1st, Attaching the adjusting weight of the magnet case directly to the universal joint on which said case turns and swings. 2d, The arrangement of the pointer which designates the number of degrees at which the movable frame and telescope stand, adjusted on an adjusting screw, which has the surface of its head graduated so as to indicate minutes, in combination with a stationary pointer, and with an extension formed on the pointer, which comes opposite the degrees on the magnet case.

121. Steam Valves; John E. Wootten, Philadelphia, Pennsylvania.

Claim—The application of the anti-friction roller, in combination with a diaphragmatic piston, or an equivalent therefor.

122. Apparatus for Evaporating; Wm S. Worthington, Newton, New York.

Claim—The arrangement of a series of two or more grated fire-places, a b c, and communicating passages, f g, and flues h h, in a casing, c, on each or either side of a pan or train of pans.

123. Electro-magnetic Apparatus for Setting Water Engines in Motion; Moses G. Farmer, Salem, Assignor to Wm. F. Channing, Boston, Massachusetts.

Claim—1st, The combination of an electro-magnetic escapement with the cock or water valve, and with the detent of a water engine, separately or conjointly, for the purpose of controlling its motion from a distance, especially in its application to a fire alarm telegraph. 2d, The employment of two or more arms, of progressively increasing weight, in combination with a water engine, and with an electro-magnet, or its equivalent, for the purpose of releasing machinery, as set forth—the first of the weighted arms being liberated by the electro-magnet, while the last one of the series releases the machinery, each of the weighted arms being returned to its normal position by the action of the water engine.

124 Gas Burners; Wm. Wright, Assignor to self and Frederick Wright, City of New York.

Claim—A gas burner provided with a double flanched cup having openings, and otherwise constructed, substantially as described.

125. Automatic Grain Scales; Joseph R. Gates, Indianapolis, Assignor to self and Alexander Corey, Shelbyville, Indiana.

Claim—1st, The lever and spring, when used for the treble purpose of operating the cut-off gate, discharging or loosening the bottom valve, and preventing the weights from raising the scale-box and drawing the slide until the bottom is closed, thereby regulating the cut-off and flow of grain, without using the weight of the grain while the same is being weighted. 2d, The combination and arrangement of the spring and weight, m, with the elbow lever, k, connecting rod, j, and lever, i, when constructed as described.

126. Mode of Attaching Thills to Axles; George Kenny, Milford, Assignor to self and Josephus Baldwin, Nashua, New Hampshire.

Claim—The combination of the pressing and locking india rubber tube with the eyes and bolt, with its nut, substantially in the manner described.

127. Machine for Sawing Marble; James Lyon, Assignor to Jesse J. Davis, City of New York.

Claim—The arrangement of the reciprocating bar, adjustable rollers, adjustable frames, and diagonally slatted sides, in relation to each other, and to parts that connect with and guide the saws, for the purposes specified.

128. Manufacture of Emery Wheels and Sticks; Thomas J. Mayall, Roxbury, Assignor to self and George M. Davis, Boston, Massachusetts.

Claim.—The employment of vulcanized rubber tempered with olive oil, in combination with powdered emery, or its equivalent, for the manufacture of polishing wheels and sticks.

129. Elastic Draw-bar and Bumper; Thomas J. Mayall, Roxbury, Assignor to self and Benjamin F. Cook, Boston, Massachusetts.

Claim—The combined draw-bar and bumper, consisting of the elastic cylinder, the heads, bars, spring, and bolt, constructed as set forth.

130. Mowing Machines; Thomas Windell, Assignor to J. B. Ford, James W. Shield, and H. L. Bridewell, New Albany, Indiana.

Claim—1st, The employment, in connexion with a single frame piece of the box, which is cast in the manner specified, with axle, journal bearings, and flanches, in one piece, for the purpose of connecting and securing all the gearing necessary for the operation of the machine. 2d, The spring, secured at one end

to the front of the outer guard, and playing freely in the opening of the rear of said guard, in combination with the adjusting screw. whereby the convexity of the spring shoe is increased and diminished with the elevation or depression of the cutter.

131. Method of Enabling Moving Railroad Trains to Telegraph their own Passings at Certain Stations; Ernest Otto Pohl, Philadelphia, Pennsylvania.

Claim—The use of a self-acting electro-magnetic railway alarm telegraph, acting reliably of itself without the necessity of human intervention, and arranged and operating in the manner described.

132. Printing Presses; F. O. Degener, City of New York; ante-dated July 11, 1858.

Claim—Arranging or hanging an oscillating bed with an oscillating platen, in such manner that the motion of one will control the action of the other, so that by their forward movement they shall close and give an impression, and upon their reverse movement the form shall be inked, and the platen be brought into the proper position necessary for the reception of the sheet, and thus alternate from one of their positions to the other. Also, the arrangement of an oscillating bed and platen with the cam to cause the frisket to assume the desired position, so as to hold the sheet of paper while it is being conveyed from one position to the other.

133. Nursery Bottles; W. B. Potter, Boston, Massachusetts.

Claim—A nursing bottle of glass, having a metallic cap screwed upon it, and a metallic lacteal tube, when said cap is provided with a flanch for the reception of the elastic nipple.

134. Grinding Mills; Alfred Proseus, Philadelphia, Pennsylvania.

Claim—Placing across the recesses formed by the teeth of the shells, or of those of the burrs, or of both, of conical grinding mills, any convenient number of obstructing strips.

135. Machine for Dressing Hoops; Augustus Prenatt, Buffalo, New York.

Claim—Placing the cutters in the cutter head in such position that the plane of their cutting edge will cross their axis of motion at an angle of 45° (or nearly so), and also stand inclined to the horizontal plane of their axis at an angle of 45° (or nearly so). Also, the arrangement of the cutter in the vertically moving grate, including the adjustable roller, for the purpose of dressing the edge of the hoop, and for giving the hoop any required width, as described.

MECHANICS, PHYSICS, AND CHEMISTRY.

*Science as a Branch of Education.** By Professor Faraday, D.C.L., F.R.S.

[Abstract of a Lecture before the Royal Institution of Great Britain.]

The development of the applications of physical science in modern times has become so large and so essential to the well-being of man, that it may justly be used as illustrating the true character of pure science, as a department of knowledge, and the claims it may have for consideration by governments, universities, and all bodies to whom is confided the fostering care and direction of learning. As a branch of learning, men are beginning to recognise the claim of science to its own particular place; for, though flowing in channels utterly different in their course and end to those of literature, it conduces not less, as a means of instruction, to the discipline of the mind; whilst it ministers, more or less, to the wants, comforts, and proper pleasure, both mental and bodily, of every individual of every class in life. Until of late years, the education for, and recognition of, it by the bodies which may be considered as giving the general course of all education, have been chiefly directed to it only as it could serve professional services, —namely, those which are remunerated by society; but now the fitness of university degrees in science is under consideration, and many are taking a high view of it, as distinguished from literature, and think that it may be well studied for its own sake, *i. e.*, as a proper exercise of the human intelligence, able to bring into action and development all the powers of the mind. As a branch of learning, it has (without reference to its applications,) become as extensive and varied as literature; and it has this privilege, that it must ever go on increasing.

* From the London Mechanics' Magazine, July, 1858.

Thus it becomes a duty to foster, direct, and honor it, as literature is so guided and recognised; and the duty is the more imperative, as we find by the unguided progress of science and the experience it supplies, that, of those men who devote themselves to studious education, there are as many whose minds are constitutionally disposed to the studies supplied by it, as there are of others more fitted by inclination and power to pursue literature.

The value of the public recognition of science as a leading branch of education may be estimated in a very considerable degree by observation of the results of the education which it has obtained incidentally from those who, pursuing it, have educated themselves. Though men may be specially fitted by the nature of their minds for the attainment and advance of literature, science, or the fine arts, all these men, and all others, require first to be educated in that which is known in these respective mental paths; and, when they go beyond this preliminary teaching, they require a self-education directed (at least in science) to the highest reasoning power of the mind. Any part of pure science may be selected to show how much this private self-teaching has done, and by that to aid the present movement in favor of the recognition generally of scientific education in an equal degree with that which is literary, but perhaps electricity, as being the portion which has been left most to its own development, and has produced as its results the most enduring marks on the face of the globe, may be referred to. In 1800, Volta discovered the voltaic pile; giving a source and form of electricity before unknown. It was not an accident, but resulted from his own mental self-education: it was, at first, a feeble instrument, giving feeble results; but by the united mental exertions of other men, who educated themselves through the force of thought and experiment, it has been raised up to such a degree of power as to give us light, and heat, and magnetic and chemical action, in states more exalted than those supplied by any other means.

In 1819, Oersted discovered the magnetism of the electric current, and its relation to the magnetic needle; and, as an immediate consequence, other men, as Arago and Davy, instructing themselves by the partial laws and action of the bodies concerned, magnetized iron by the current. The results were so feeble at first as to be scarcely visible; but, by the exertion of self-taught men since then, they have been exalted so highly as to give us magnets of a force unimaginable in former times.

In 1831, the induction of electrical currents one by another, and the evolution of electricity from magnets, was observed,—at first in results so small and feeble that it required one much instructed in the pursuit to perceive and lay hold of them; but these feeble results, taken into the minds of men already partially educated and ever proceeding onwards in their self-education, have been so developed as to supply sources of electricity independent of the voltaic battery or the electric machine, yet having the power of both combined in a manner and degree which they neither separate nor together could ever have given it, and applicable to all the practical electrical purposes of life.

To consider all the departments of electricity fully, would be to lose the argument for its fitness in subserving education in the vastness of its extent; and it will be better to confine the attention to one application, as the electric telegraph, and even to one small part of that application, in the present case. Thoughts of an electric telegraph came over the minds of those who had been instructed in the nature of electricity, as soon as the conduction of that power with extreme swiftness through metals was known, and grew as the knowledge of that branch of science increased. The thought, as realized at the present day, includes a wonderful amount of study and development. As the end in view presented itself more and more distinctly, points at first apparently of no consequence to the knowledge of the science generally, rose into an importance which obtained for them the most careful culture and examination, and the almost exclusive exercise of minds whose powers of judgment and reasoning had been raised first by general education, and who, in addition, had acquired the special kind of education which the science in its previous state could give. Numerous and important as the points are which have been already recognised, others are continually coming into sight as the great development proceeds, and with a rapidity such as to make us believe that, much as there is known to us, the unknown far exceeds it, and that, extensive as is the teaching of method, facts, and law, which can be established at present, an education looking for far greater results should be favored and preserved.

The results already obtained are so large, as even in money value to be of very great importance;—as regards their higher influence upon the human mind, especially when that is considered in respect of cultivation, I trust they are, and ever will be, far greater. No intention exists here of comparing one telegraph with another, or of assigning their respective dates, merits, or special uses. Those of Mr. Wheatstone are selected for the visible illustration of a brief argument in favor of a large public recognition of scientific education, because he is a man both of science and practice, and was one of the very earliest in the field, and because certain large steps in the course of his telegraphic life will tell upon the general argument. Without referring to what he had done previously, it may be observed that in 1840 he took out patents for electric telegraphs which included, amongst other things, the use of the electricity from magnets at the communicator, —the dial face,—the step-by-step motion,—and the electro-magnet at the indicator. At the present time, 1858, he has taken out patents for instruments containing all these points; but these instruments are so altered and varied in character above the former, that an untaught person could not recognise them. The changes may be considered as the result of education upon the one mind which has been concerned with them, and are to me strong illustrations of the effects which general scientific education may be expected to produce.

In the first instruments powerful magnets were used, and keepers with heavy coils associated with them. When magnetic electricity was first discovored, the signs were feeble, and the mind of the student was

led to increase the results by increasing the force and size of the instruments. When the object was to obtain a current sufficient to give signals through long circuits, large apparatus were employed, but these involved the inconveniences of inertia and momentum; the keeper was not set in motion at once, nor instantly stopped; and, if connected directly with the reading indexes, these circumstances caused an occasional uncertainty of action. Prepared by its previous education, the mind could perceive the disadvantages of these influences, and could proceed to their removal; and now a small magnet is used to send sufficient currents through 12, 20, 50, a hundred, or several hundred miles; a keeper and helix is associated with it, which the hand can easily put in motion; and the currents are not sent out of the indicating instrument to tell their story until a key is depressed, and thus irregularity contingent upon first action is removed. A small magnet, ever ready for action and never wasting, can replace the voltaic battery; if powerful agencies be required, the electro-magnet can be employed without any change in principle or telegraphic practice; and, as magneto-electric currents have special advantages over voltaic currents, these are in every case retained. These advantages I consider as the results of scientific education, much of it not tutorial, but of self; but there is a special privilege about the science-branch of education, namely, that what is personal in the first instance immediately becomes an addition to the stock of scientific learning, and passes into the hands of the tutor, to be used by him in the education of others, and enable them in turn to educate themselves. How well may the young man entering upon his studies in electricity be taught by what is past to watch for the smallest signs of action, new or old; to nurse them up by any means until they have gained strength; then to study their laws, to eliminate the essential conditions from the non-essential, and at last to refine again, until the encumbering matter is as much as possible dismissed, and the power left in its highly developed and most exalted state.

The alterations or successions of currents produced by the movement of the keeper at the communicator pass along the wire to the indicator at a distance; there each one for itself confers a magnetic condition on a piece of soft iron, and renders it active or repulsive of small permanent magnets; and these, acting in turn on a propelment, cause the index to pass at will from one letter to another on the dial face. The first electro-magnets, *i. e.*, those made by the circulation of an electric current round a piece of soft iron, were weak; they were quickly strengthened, and it was only when they were strong that their laws and actions could be successfully investigated. But now they were required small, yet potential. Then came the teaching of Ohm's law; and it was only by patient study under such teaching that Wheatstone was able so to refine the little electro-magnets at the indicator, as that they should be small enough to consist with the fine work there employed, able to do their appointed work when excited in contrary directions by the brief currents flowing from the original common magnet, and unobjectionable in respect of any resistance they might offer to the transit of these tell-tale currents.

These small transitory electro-magnets attract and repel certain permanent magnetic needles, and the to-and-fro motion of the latter is communicated by a propelment to the index, being there converted into a step-by-step motion. Here everything is of the finest workmanship, the propelment itself requires to be watched by a lens, if its action is to be observed; the parts never leave hold of each other; the vibratory or rotary ratchet wheel and the fixed pallets are always touching; and thus allow of no detachment or loose shake; the holes of the axes are jeweled; the moving parts are most carefully balanced, a consequence of which is that agitation of the whole does not disturb the parts, and the telegraph works just as well when it is twisted about in the hands, or placed on board a ship or in a railway carriage, as when fixed immovably. When it is possible, as in the vibratory needle, the moving parts are brought near to the centre of motion, that the inertia of the portion to be moved, or the momentum of that to be stopped, should be as small as possible, and thus great quickness of indication obtained. All this delicacy of arrangement and workmanship is introduced advisedly; for the inventor, whom I may call the student here, considers that refined and perfect workmanship is more exact in its action, more unchangeable by time and use, and more enduring in its existence, than that which, being heavier, must be coarser in its workmanship, less regular in its action, and less fitted for the application of force by fine electric currents.

Now there was no accident in the course of these developments;—if there were experiments, they were directed by the previously acquired knowledge;—every part of the investigations was made and guided by the instructed mind. The results being such (and like illustrations might be drawn from other men's telegraphs, or from other departments of electrical science), then, if the term education may be understood in so large a sense as to include all that belongs to the improvement of the mind, either by the acquisition of the knowledge of others or by increase of it through its own exertions, we learn by them what is the kind of education science offers to man. It teaches us to be *neglectful* of nothing;—not to despise the small beginnings, for they precede of necessity all great things in the knowledge of science, either pure or applied. It teaches a continual comparison of the *small and great*, and that under differences almost approaching the infinite: for the small as often contains the great in principle as the great does the small; and thus the mind becomes comprehensive. It teaches to deduce principles carefully, to hold them firmly, or to suspend the judgment:—to discover and obey *law*, and by it to be bold in applying to the greatest what we know of the smallest. It teaches us first by tutors and books to learn that which is already known to others, and then by the light and methods which belong to science to learn for ourselves and for others;—so making a fruitful return to man in the future for that which we have obtained from the men of the past. Bacon, in his instruction, tells us that the scientific student ought not to be as the ant, who gathers merely; nor as the spider, who spins from her own bowels; but rather as the bee, who both gathers and produces.

All this is true of the teaching afforded by any part of physical science. Electricity is often called wonderful, beautiful; but it is so only in common with the other forces of nature. The beauty of electricity, or of any other force, is not that the power is mysterious and unexpected, touching every sense at unawares in turn, but that it is under *law*, and that the taught intellect can even now govern it largely. The human mind is placed above, not beneath it; and it is in such a point of view that the mental education afforded by science is rendered supereminent in dignity, in practical application, and utility; for, by enabling the mind to apply the natural power through law, it conveys the gifts of God to man.

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*Units of Work.**

The following are the results obtained in units of work or foot-pounds for one unit of heat by different authors.

	Centigrade thermometer. Foot-pounds.	Fahrenheit thermometer. Foot-pounds.
By Holtzman's formula,	1227	682
By Joule's experiments,	1386	770
By Rankine's formula,	1252	695
By Thompson's formula,*	1390	772
For the best Cornish engine, by M. De Pambour,	148	82
For a perfect low-pressure condensing engine,	90·8	50·4
For an actual Boulton and Watt's engine,	46	25·5

Ransome's Process for Preserving Stone.† By R. Hunt.

The importance of the discovery of a process, which could be relied on, for the preservation of the stones employed in the erection of our public and other buildings, has long been felt; and many experiments have been made in the hope of attaining this object. In London, and in several of the large towns in the Provinces, we could point to buildings which have within a very few years exhibited the most unmistakable signs of decay. Lamina after lamina falls off, exposing a new surface to be freshly acted upon by the destroying agents; and thus, with comparative rapidity, the work of decay progresses; this has been referred to atmospheric causes, existing *now* as the result of our extensive manufactories and greatly increased population; but, to whatever cause the disintegration of the stone may be traced, certain it is, that scarcely any modern building, whether constructed of the coal measure sandstones, dolomites, oolites, or other well-known building stones, but exhibits, in a few years after its completion, lamentable evidences of decay.

Our attention has been directed to the Baptist Chapel built by Sir Morton Peto, in Bloomsbury. For some time past the Caen stone used in this structure has been crumbling, especially where it was exposed

* From the London Civ. Eng. and Arch. Jour., September, 1858.

† From the London Art Journal, October, 1858.

to the action of water. The disintegration was proceeding so rapidly that it became necessary to give immediate attention to it. It was determined that Mr. Frederick Ransome should make an experiment upon the towers, where the stone was in a worse condition than in any other part. The result of this experiment was so satisfactory that it was resolved that the entire building should be subjected to this process.

The most enduring stones in nature are those in which the cementing agent is *silica*—and it became a problem with the patentee, to produce a true *siliceous surface* upon any stones which appeared naturally liable to decay. All the sandstones are more or less porous, consequently they absorb water readily—this is one cause of their rapid disintegration. Availing himself of this, Mr. Ransome produces the desired result. First, the stone is made to absorb as much of a solution of the silicate of soda as possible; this being effected, it is washed with chloride of calcium. The play of chemical affinity is now brought into action *in the stone:* a double decomposition is effected, and insoluble silicate of lime fills the interstices; chloride of sodium (common salt) being formed, which is readily removed. It will be evident to all, that since every particle of the stone, to the depth penetrated by the solution, is surrounded by this silicate of soda, and that too—according to the law of surface action—in a concentrated form, that the silicate of lime which results from the action of the chloride on it, must completely fill the interstitial spaces, and thus render a stone, which was previously absorbent, absolutely non-absorbent.—(*Vide Art Journal,* Sept., 1857.

It will be found, that the stone surface of the Rev. W. Brock's chapel is now actually repellent of water, and that the hardness of the surface indicates a complete casing of the preservative silica. It should be distinctly understood that this process will not merely protect new stone from the influences of atmospheric action, but it stops decay in stones already exfoliating, and preserves them from future action.

Stones which have been in a state of rapid decomposition have been, for experiment, partially treated by this silicifying process. The result has been that the prepared parts have withstood the action of air, rain, and frost, showing no signs of injury, while the unprepared parts have completely broken up.

Beyond this, its preservative power, another advantage of the process is, that it can be applied to any stone without in the slightest degree affecting its color or grain: all the natural conditions are preserved, and the hardening superinduced.

Now that a well-known public building has been treated by this process, the result can be observed by every one. The *rationale* of the process alone—independently of the experiments which have been made—satisfies us that there is little chance of disintegration ensuing after the proper application of the solutions. We hope to watch the influences of heat and cold upon the surface of the Bloomsbury Baptist Chapel, and we will faithfully report the results of our examination to the readers of the *Art Journal.*

*Improvements in the Art of Engraving.** Patented in London, by WILLIAM HENRY FOX TALBOT, April 21, 1858.

In this invention I employ plates of steel, copper, or zinc, such as are commonly used by engravers. Before using a plate, its surface should be well cleaned. It should then be rubbed with a linen cloth dipped in a mixture of caustic soda, and whiting, in order to remove any remaining trace of greasiness. The plate is then to be rubbed dry with another linen cloth; this process is then to be repeated, after which the plate is, in general, sufficiently clean.

In order to engrave a plate I first cover it with a substance which is sensitive to light. This is prepared as follows:—About a quarter of an ounce of gelatine is dissolved in eight or ten ounces of water, by the aid of heat. To this solution is added about one ounce by measure, of a saturated solution of bichromate of potash in water, and the mixture is strained through a linen cloth. The best sort of gelatine for the purpose is that used by cooks and confectioners, and commonly sold under the name of gelatine. In default of this, isinglass may be used, but it does not answer so well. Some specimens of isinglass have an acidity which slightly corrodes and injures the metal plates. If this accident occurs, ammonia should be added to the mixture, which will be found to correct it. This mixture of gelatine and bichromate of potash keeps good for several months, owing to the antiseptic and preserving power of the bichromate. It remains liquid and ready for use at any time during the summer months, but in cold weather it becomes a jelly, and has to be warmed before using it. It should be kept in a cupboard or dark place. The proportions given above are convenient, but they may be considerably varied without injuring the result. The engraving process should be carried on in a partially darkened room, and is performed as follows:—

A little of this prepared gelatine is poured on the plate to be engraved, which is then held vertical, and the superfluous liquid allowed to drain off at one of the corners of the plate; it is then held in a horizontal position over a spirit lamp, which soon dries the gelatine, which is left as a thin film of a pale yellow color covering the metallic surface, and generally bordered with several narrow bands of prismatic colors. These colors are of use to the operator, by enabling him to judge of the thinness of the film. When it is very thin the prismatic colors are seen over the whole surface of the plate. Such plates often make excellent engravings; nevertheless, it is perhaps safer to use gelatine films which are a little thicker. Experience alone can guide the operator to the best result. The object to be engraved is then laid on the metal plate and screwed down upon it in a photographic copying frame. Such objects may be either material substances, as lace, the leaves of plants, &c., or they may be engravings, or writings, or photographs, &c., &c.

* From the Repertory of Patent Inventions, Nov. 1858.

The plate bearing the object upon it is then to be placed in the sunshine for a space of time, varying from one to several minutes, according to circumstances. Or else it may be placed in common daylight, but of course for a longer time. As in other photographic processes, the judgment of the operator is here called into play, and his experience guides him as to the proper time of exposure to the light. When the frame is withdrawn from the light, and the object removed from the plate, a faint image is seen upon it, the yellow color of the gelatine having turned brown wherever the light has acted. This process, so far as I have yet described it, is in all essential respects identical with that which I described in the specification of my former patent for improvements in engraving, bearing date the 29th of October, 1852.

The novelty of the present invention consists in the improved method by which the photographic image obtained in the manner above described is engraved upon the metal plate. The first of these improvements is as follows:—I formerly supposed that it was necessary to wash the plate bearing the photographic image in water, or in a mixture of water and alcohol, which dissolves only those portions of the gelatine on which the light has not acted. And I believe that all other persons who have employed this method of engraving by means of gelatine and bichromate of potash have followed the same method, viz: that of washing the photographic image. But, however carefully this process is conducted, it is frequently found when the plate is again dry that a slight disturbance of the image has occurred, which of course is injurious to the beauty of the result. And I have now ascertained that it is not at all necessary to wash the photographic image. On the contrary, much more beautiful engravings are obtained upon plates which have not been washed, because the more delicate lines and details of the picture have not been disturbed. The process which I now employ is as follows:—When the plate bearing the photographic image is removed from the copying frame, I spread over its surface carefully and very evenly a little finely-powdered gum copal (in default of which common resin may be employed). It is much easier to spread this resinous powder evenly upon the surface of the gelatine than it is to do so upon the naked surface of a metal plate. The chief error the operator has to guard against is that of putting on too much of the powder; the best results are obtained by using a very thin layer of it, provided it is uniformly distributed. If too much of the powder is laid on, it impedes the action of the etching liquid. When the plate has been thus very thinly powdered with copal it is held horizontally over a spirit lamp in order to melt the copal. This requires a considerable heat. It might be supposed that this heating of the plate, after the formation of a delicate photographic image upon it, would disturb and injure that image, but it has no such effect. The melting of the copal is known by its change of color. The plate should then be withdrawn from the lamp and suffered to cool. This process may be called the laying on aquatint ground upon the gelatine, and I believe it to be a new process. In the common mode of laying on an aquatint ground, the resinous particles are laid upon the naked surface of the metal before the en-

graving is commenced. The gelatine being thus covered with a layer of copal disseminated uniformly and in minute particles, the etching liquid is to be poured on. This is prepared as follows:—Muriatic acid, otherwise called hydrochloric acid, is saturated with peroxide of iron, as much as it will dissolve with the aid of heat. After straining the solution to remove impurities, it is evaporated till it is considerably reduced in volume, and is then poured off into bottles of a convenient capacity. As it cools it solidifies into a brown semi-crystalline mass. The bottles are then well corked up and kept for use.

I shall call this preparation of iron by the name of per-chloride of iron in the present specification, as I believe it to be identical with the substance described by chemical authors under that name. For example, see "Turner's Chemistry," 5th edition, page 537; and by others called permuriate of iron. For example, see "Brande's Manual of Chemistry," 2d edition, vol. ii, page 117.

It is a substance very attractive of moisture. When a little of it is taken from a bottle in the form of a dry powder and laid upon a plate it quickly deliquesces, absorbing the atmospheric moisture. In solution in water it forms a yellow liquid in small thicknesses, but chesnut-brown in greater thicknesses. In order to render its mode of action in photographic engraving more intelligible, I will first state that it can be very usefully employed in common etching; that is to say, that if a plate of copper, steel, or zinc is covered with an etching ground and lines are traced on it with a needle's point, so as to form any artistic subject, then, if the solution of perchloride of iron is poured upon the plate it quickly effects an etching, and does this without disengaging bubbles of gas, or causing any smell, for which reason it is much more convenient to use than aquafortis, and also because it does not injure the operator's hands or his clothes, if spilt upon them.

It may be employed of various strengths for common etching, but requires peculiar management for photoglyphic engraving. And as the success of that mode of engraving chiefly turns upon this point, it should be well attended to.

Water dissolves an extraordinary quantity of perchloride of iron, sometimes evolving much heat during the solution. I find that the following is a convenient way of proceeding:—A bottle, No. 1, is filled with a saturated solution of perchloride of iron in water.

A bottle, No. 2, with a mixture consisting of five or six parts of the saturated solution, and one part of water.

And a bottle, No. 3, with a weaker liquid, consisting of equal parts of water and of the saturated solution. Before attempting an engraving of importance it is almost essential to make preliminary trials, in order to ascertain that these liquids are of the proper strengths. These trials I shall therefore now proceed to point out. I have already explained how the photographic image is made on the surface of the gelatine and covered with a thin layer of powdered copal or resin, which is then melted by holding the plate over a lamp. When the plate has become perfectly cold it is ready for the etching process, which is performed as follows:—A small quantity of the solution in bottle No. 2, namely,

that consisting of five or six parts saturated solution to one of water, is poured upon the plate and spread with a camel-hair brush evenly all over it. It is not necessary to make a wall of wax round the plate, because the quantity of liquid employed is so small, that it has no tendency to run off the plate. The liquid penetrates the gelatine wherever the light has not acted on it, but it refuses to penetrate those parts upon which the light has sufficiently acted. It is upon this remarkable fact that the art of photoglyphic engraving is mainly founded. In about a minute the etching is seen to begin, which is known by the parts etched turning dark-brown or black, and then it spreads over the whole plate, the details of the picture appearing with great rapidity in every quarter of it. It is not desirable that this rapidity should be too great, for in that case it is necessary to stop the process before the etching has acquired sufficient depth (which requires an action of some minutes duration). If, therefore, the etching on trial is found to proceed too rapidly, the strength of the liquid in bottle No. 2 must be altered (by adding some of the saturated solution to it) before it is employed for another engraving. But if, on the contrary, the etching fails to occur after the lapse of some minutes, or if it begins, but proceeds too slowly, this is a sign that the liquid in bottle No. 2 is too strong, and too nearly approaching saturation. To correct this, a little water must be added to it before it is employed for another engraving. But in doing this the operator must take notice that a very minute quantity of water, added often, makes a great difference and causes the liquid to etch very rapidly. He will, therefore, be careful in adding water not to do so too freely. When the proper strength of the solution in bottle No. 2 has just been adjusted, which generally requires three or four experimental trials, it can be employed with security. Supposing, then, that it has been ascertained to be of the right strength, the etching is commenced as above mentioned, and proceeds till all the details of the picture have become visible, and present a satisfactory appearance to the eye of the operator, which generally occurs in two or three minutes; the operator stirring the liquid all the time with a camel-hair brush, and thus slightly rubbing the surface of the gelatine, which has a good effect. When it seems likely that the etching will improve no farther, it must be stopped. This is done by wiping off the liquid with cotton wool, and then rapidly pouring a stream of cold water over the plate, which carries off all the remainder of it. The plate is then wiped with a clean linen cloth, and then rubbed with soft whiting and water to remove the gelatine. The etching is then found to be completed.

I will now describe another etching process very slightly differing from the former, which I often use. When the plate is ready for etching, pour upon it a small quantity of the liquid No. 1 (the saturated solution). This should be allowed to rest upon the plate one or two minutes. It has no very apparent effect, but it acts usefully in hardening the gelatine. It is then poured off from the plate, and a sufficient quantity of solution No. 2 is poured on. This effects the etching in the manner before described; and if this appears to be quite satisfactory,

nothing further is required to be done. But it often happens that certain faint portions of the engraving, such as distant mountains or buildings in a landscape, refuse to appear, and as the engraving would be imperfect without them I recommend the operator in that case to take some of the weak liquid No. 3 in a little saucer, and without pouring off the liquid No. 2, which is etching the picture, to touch with a camel-hair brush, dipped in liquid No. 3, those points of the picture where he wishes for an increased effect. This simple process often causes the wished-for details to appear, and that sometimes with great rapidity, so that caution is required in the operator in using this weak solution, No. 3, especially lest the etching liquid should penetrate to the parts which ought to remain white. But in skilful hands, its employment cannot fail to be advantageous, for it brings out soft and faint shadings, which improve the engraving, and which would otherwise probably be lost. Experience is requisite in this as in most other delicate operations connected with photography; but I have endeavored clearly to explain the leading principles of this new process of engraving according to the mode which I have hitherto found the most successful.

With respect to the second invention mentioned in my provisional specification, in which the electrotype process is employed, I have found that it gives less successful results than that which I have fully described above, and I have therefore omitted it from this specification, and make no claim with respect to it.

In conclusion I would remark, that besides the process of photographic engraving considered as a whole being new, I believe the following points also to be new, viz :—

First, the etching a photographic image formed upon a surface of gelatine and bichromate of potash, without first disturbing that surface by washing it with water or alcohol.

Second, the laying an aquatint ground of resin or copal upon a surface of gelatine, and not, as usual, upon the naked metallic surface of the plate.

Third, after forming a photographic image on gelatine, the heating it strongly over a spirit-lamp or otherwise.

Fourth, the use and employment of perchloride of iron as an etching liquid for the production of photographic engravings.

Fifth, the use and employment of the same as a substitute for aquafortis in common etching.

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*Chemical Matches without Phosphorus or other Poison.**

By M. Canouil.

The new matches are absolutely without white or red phosphorus, ordinary or amorphous. They cannot be used as a poison, and when reduced to their least degree of inflammability give rise to no danger of fire. They are formed essentially of chlorate of potash, mixed with

* From the London Chemical Gazette, No. 388.

a small quantity of a metallic peroxide, bichromate, or oxysulphuret, when it is desired to render them more inflammable. The author has found means to triturate the chlorate of potash, even when dry, without danger of explosion.

The new matches diffuse no odor, either in the manufacture or in use; they light without explosion or projection.—*Comptes Rendus*, June 28, 1858, p. 1268.

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*On the Hardness of Metals and Alloys.** By F. CRACE CALVERT, M.R.A., of Turin, F.C.S., &c.; and RICHARD JOHNSON, F.C.S., &c.

[Read before the Literary and Philosophical Society of Manchester.]

The process at present adopted for determining the comparative degree of hardness of bodies, consists in rubbing one body against another, and that which indents or scratches the other is admitted to be the harder of the two bodies experimented upon. Thus, for example:

Diamond,	Quartz,	Iron,	Tin,
Topaz,	Steel,	Copper,	Lead.

This method is not only very unsatisfactory in its results, but it is also inapplicable for determining with precision the various degrees of hardness of the different metals and their alloys. We therefore thought that it would be useful and interesting if we were to adopt a process which would enable us to represent by numbers the comparative degrees of hardness of various metals and their alloys.

To carry out these views we devised the following apparatus and method of operating. The machine used is on the principle of a lever, with this important modification, that the piece of metal experimented upon can be relieved from the pressure of the weight employed without removing the weight from the end of the longer arm of the lever. The machine consists of a lever, with a counterpoise and a plate, on which the weights are gradually placed; the fulcrum bears on a square bar of iron, passing through supports. The bar is graduated, and has at its end a conical steel point, 7 *mm.* or 0·275 of an inch long, 5 *mm.* or 0·197 of an inch wide at the base, and 1·25 *mm.* or 0·049 of an inch wide at the point which bears on the piece of metal to be experimented on, and this is supported on a solid piece of iron. The support, or point of resistance, is lowered or raised by a screw, and when, therefore, this screw is turned, the whole of the weight on the lever is borne by the support and the screw. When it is necessary, by turning the screw, the weight on the lever is re-established on the bar, and experimented upon.

When we wished to determine the degree of hardness of a substance, we placed it on the plate, and rested the point upon it, noticing the exact mark on the bar, and then gradually added weights on the end of the lever until the steel point entered 3·5 *mm.* or 0·128 of an inch during half an hour, and then read off the weight. A result was never accepted without at least two experiments being made, which corresponded so far as to present a difference of only a few pounds. The

* From the Journal of the Society of Arts, No 314.

following table gives the relative degree of hardness of some of the more common metals. We specially confine our researches to this class, wishing the results to be practically useful to engineers and others who have to employ metals, and often require to know the comparative hardness of metals and alloys.

Names of Metals.	Weight employed.	Calculated Cast Iron = 1000.
Staffordshire Cold Blast Cast Iron —Grey, No. 3,	4800 lbs.	1000
Steel,	4600?	958?
Wrought Iron,*	4550	948
Platinum,	1800	375
Copper—pure,	1445	301
Aluminium,	1300	271
Silver—pure,	1000	208
Zinc "	880	183
Gold "	800	167
Cadmium"	520	108
Bismuth "	250	52
Tin "	130	27
Lead "	75	16

* This wrought iron was made from the above mentioned cast iron.

This table exhibits a curious fact, viz: the high degree of hardness of cast iron as compared with that of all other metals, and although we found alloys which possessed an extraordinary degree of hardness, still none were equal to cast iron.

The first series of alloys we shall give, is that of copper and zinc.

Formulæ of Alloys and per centages.		Weight Employed.	Obtained Cast Iron = 1000.	Calculated* Cast Iron = 1000.
Zn Cu_5	Cu 82·95, Zn 17·05	2050 lbs.	427·08	280·83
Zn Cu_4	Cu 79·56, Zn 20·44	2250	468·75	276·82
Zn Cu_3	Cu 74·48, Zn 25·52	2250	468·75	276·04
Zn Cu_2	Cu 66 06, Zn 33·94	2270	472·92	261·04
Zn Cu	Cu 49·32, Zn 50·68	2900	604·17	243·33
Cu Zn_2	Cu 32·74, Zn 67·26	Broke with 1500 lbs. without the point entering.		
Cu Zn_3	Cu 24·64, Zn 75·36	Broke with 1500 lbs. with an impression ½ *mm.* deep.		
Cu Zn_4	Cu 19·57, Zn 80·43	Entered a little more than the above; broke with 2000 lbs.		
Cu Zn_5	Cu 16·30, Zn 83·70	Entered 2 *mm.* with 1500 lbs.; broke with 1700 lbs.		

* To calculate the hardness of an alloy, we multiplied the per centage quantity of each metal by the respective hardness of that metal, added the two results together, and divided by 100. The quotient is the theoretical hardness.

These results show that all the alloys containing an excess of copper are much harder than the metals composing them, and, what is

not less interesting, that the increased degree of hardness is due to the zinc, the softer metal of the two which compose these alloys. The quantity of this metal must, however, not exceed 50 ℘ cent. of the alloy, or the alloy becomes so brittle that it breaks as the steel point penetrates. We believe that some of these alloys, with an excess of zinc, and which are not found in commerce owing to their white appearance, deserve the attention of engineers. There is in this series an alloy to which we wish to draw special attention, viz: the alloy Cu Zn, composed in 100 parts of

Copper, . .	49·32
Zinc, . .	50·68
	100·00

Although this alloy contains about 20 ℘ cent. more zinc than any of the brasses of commerce, still it is, when carefully prepared, far richer in color than the ordinary alloys of commerce. The only reason that we can give why it has not been introduced into the market is, that when the amount of zinc employed exceeds 33 ℘ cent., the brass produced becomes so white that the manufacturers have deemed it advisable not to exceed that proportion. If, however, they had increased the quantity to exactly 50·68 ℘ cent., and mixed the metals well, they would have obtained an alloy as rich in color as if it had contained 90 ℘ cent. of copper, and of a hardness three times as great as that given by calculation. In order to enable engineers to form an opinion as to the value of this cheap alloy, we give them the degrees of hardness of several commercial brasses:—

Commercial Brasses.		Weight employed.	Cast Iron = 1000.	
			Obtained.	Calculated.
"Large Bearing,"	Copper, 82·05 *Tin, 12·82 Zinc, 5·13	lbs. 2700	562	259
"Mud Plugs,"	Copper, 80·00 *Tin, 10·00 Zinc, 10·00	3600	750	262
"Yellow Brass,"	Copper, 64·00 Zinc, 36·00	2500	520	258
"Pumps & Pipes,"	Copper, 80·00 *Tin, 5·00 Zinc, 7·50 Lead, 7·50	1650	343	257

* These alloys all contain tin.

The alloy Cu Zn possesses another remarkable property, viz: the facility with which it is capable of cystallizing in prisms half an inch in length, of extreme flexibility. There is no doubt that this alloy is a definite chemical compound, and not a mixture of metals, as alloys are generally considered to be. Our researches on the conductibility of heat by alloys, recently presented to the Royal Society, leave no doubt that many alloys are definite chemical compounds.

On Bronze Alloys.

Formulæ of Alloys and percentages.		Weight employed.	Obtained Cast Iron = 1000.	Calculated Cast Iron = 1000.
$Cu\ Sn_5$	Cu 9·73, Sn 90·27	400 lbs.	88·33	51·67
$Cu\ Sn_4$	Cu 11·86, Sn 88·14	460	95·81	59·56
$Cu\ Sn_3$	Cu 15·21, Sn 84·79	500	104·17	68·75
$Cu\ Sn_2$	Cu 21·21, Sn 78·79	650	135·42	84·79
$Cu\ Sn$	Cu 34·98, Sn 65·02	At 700 lbs. the point entered one-half and the alloy broke.		
$Sn\ Cu_2$	Cu 48·17, Sn 51·83	At 800 lbs. the alloy broke without the point entering.		
$Sn\ Cu_3$	Cu 61·79, Sn 38·21	At 800 lbs. the alloy broke in small pieces (blue alloy).		
$Sn\ Cu_4$	Cu 68·27, Sn 31·73	At 1300 lbs. divided the alloy in two, point not entering 1 *mm.*		
$Sn\ Cu_5$	Cu 72·90, Sn 27·10	The same as the preceding.		
$Sn\ Cu_{10}$	Cu 84·32, Sn 15·68	4400	916·66	257·08
$Sn\ Cu_{15}$	Cu 88·97, Sn 11·03	3710	772·92	270·83
$Sn\ Cu_{20}$	Cu 91·49, Sn 8·51	3070	639·58	277·70
$Sn\ Cu_{25}$	Cu 93·17, Sn 6·83	2890	602·08	279·16

The results obtained from this series of alloys lead to several conclusions deserving our notice. First, the marked softness of all the alloys containing an excess of tin; secondly, the extraordinary fact that an increased quantity of so malleable a metal as copper, should so suddenly render the alloy brittle, for the

Alloy $Cu\ Sn_2$, or

$$\left.\begin{array}{ll}\text{Copper,} & 21{\cdot}21\\ \text{Tin,} & 78{\cdot}79\end{array}\right\}\text{is not brittle.}$$

whilst the alloy Cu Sn, or

$$\left.\begin{array}{ll}\text{Copper,} & 34{\cdot}98\\ \text{Tin,} & 65{\cdot}02\end{array}\right\}\text{is brittle.}$$

Therefore the addition of 14 ℔ cent. of copper renders a bronze alloy brittle. This curious fact is observed in all the alloys with excess of copper, $Sn\ Cu_2$, $Sn\ Cu_3$, $Sn\ Cu_4$, $Sn\ Cu_5$, until we arrive at one containing a great excess of copper, viz: the alloy $Sn\ Cu_{10}$, consisting of copper 84·68 and tin 15·32, when the brittleness ceases; but, strange to say, this alloy, which contains four-fifths of its weight of copper, is, notwithstanding, nearly as hard as iron. This remarkable influence of copper in the bronze alloys is also visible in those composed of

$Sn\ Cu_{15}$, containing 88·97 of copper.
$Sn\ Cu_{20}$, " 91·49 "
$Sn\ Cu_{25}$, " 93 17 "

Copper acquires such an increased degree of hardness by being alloyed

with tin or zinc, that we thought it interesting to ascertain if alloys composed of these two metals would also have a greater degree of hardness than that indicated by theory; we accordingly had a series of alloys prepared in equivalent quantities, and these are the results arrived at:—

Formulæ of Alloys and per centages of each.		Weight employed.	Obtained Cast Iron = 1000.	Calculated Cast Iron = 1000.
$Zn\,Sn_2$	Zn 21·65, Sn 78·35	300 lbs.	64·50	60·83
$Zn\,Sn$	Zn 35·60, Sn 64·40	330	68·75	82·70
$Sn\,Zn_2$	Sn 47·49, Zn 52·51	400	83·33	110·00
$Sn\,Zn_3$	Sn 37·57, Zn 62·43	450	93·70	124·58
$Sn\,Zn_4$	Sn 31·14, Zn 68 86	505	105·20	131·22
$Sn\,Zn_5$	Sn 26·57, Zn 73·43	600	125·00	142·08
$Sn\,Zn_{10}$	Sn 15·32, Zn 84·68	580	120·33	158·33

These results show that these metals exert no action on each other, as the numbers indicating the degrees of hardness of their alloys are rather less than those required by theory. Our researches on the conductibility of heat by the three above series of alloys throw, we believe, some light on the great difference which the alloys of bronze present as compared with those of tin and zinc; for we have stated above that the latter conduct heat as a mixture of metals would do, and not as the former series, which conduct heat as definite chemical compounds.

We shall conclude by giving the degrees of hardness of two other series of alloys, viz: those composed of lead and antimony, and lead and tin. In the series of lead and tin we find that tin also increases the hardness of lead, but not in the same degree as it does that of copper.

Lead and Antimony.

Formulæ of Alloys and percentages.		Weight employed.	
$Pb\,Sb_5$	Pb 24·31, Sb 75·69	lbs.	Entered 2·5 *mm.* with 800 lbs.; then broke.
$Pb\,Sb_4$	Pb 28·64, Sb 71·36		Entered 2·7 *mm.* with 800 lbs.; broke with 900 lbs.
$Pb\,Sb_3$	Pb 34·86, Sb 65·14	875	
$Pb\,Sb_2$	Pb 44·53, Sb 55 47		Entered 2·5 *mm.* with 500 lbs.; broke with 600 lbs.
$Pb\,Sb$	Pb 61·61, Sb 38·39	500	
$Sb\,Pb_2$	Pb 76·32, Sb 23·68	385	
$Sb\,Pb_3$	Pb 82·80, Sb 17·20	310	
$Sb\,Pb_4$	Pb 86·52, Sb 13·48	300	
$Sb\,Pb_5$	Pb 88 92, Sb 11·08	295	

Lead and Tin.

Formulæ of Alloys and percentages.		Weight employed.	Obtained Cast Iron = 1000.	Calculated Cast Iron = 1000.
$Pb\,Sn_5$	Pb 26·03, Sn 73·97	200 lbs.	41·67	23·96
$Pb\,Sn_4$	Pb 30·57, Sn 69·43	105	40·62	23·58
$Pb\,Sn_3$	Pb 36·99, Sn 63·01	160	32·33	22·83
$Pb\,Sn_2$	Pb 46·82, Sn 53·18	125	26·04	20·09
$Pb\,Sn$	Pb 63·78, Sn 36·22	100	20·83	19·77
$Sn\,Pb_2$	Pb 77·89, Sn 22·11	125	26·04	18·12
$Sn\,Pb_3$	Pb 84·09, Sn 15·91	135	28·12	17·23
$Sn\,Pb_4$	Pb 87·57, Sn 12·43	125	26·04	17·08
$Sn\,Pb_5$	Pb 89·80, Sn 10·20	110	22·92	16·77

We have great pleasure in thanking here, Mr. Siméon Stoikowitsch, F.C.S., for his valuable assistance during these long researches.

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*On a method of rendering Engraved Copperplates capable of producing a greatly-increased Number of Impressions.** By F. Joubert.

Under the circumstances which I have described, it had become a desideratum to harden, if possible, the surface of a copperplate, and to protect it from wear while printing, but it is only lately that this important object has been attained.

In March last, my friend, M. Jacquin, of Paris, took out a patent in this country for a method of coating plates with iron, which had already been successfully applied in France, and of which the merit is due to my friend, M. Henri Garnier, of Paris.

I have myself had the advantage of co-operating with M. Garnier in the development of the invention, the principles of which I shall now proceed to describe:—

If the two wires of a galvanic battery be plunged separately into a solution of iron, having ammonia for its basis, the wire of the positive pole is immediately acted upon, while that of the negative pole receives a deposit of the metal of the solution—this is the principle of the process which we have named "acierage."

The operation takes place in this way:—By placing at the positive pole a plate or sheet of iron, and immersing it in a proper iron solution, the metal will be dissolved under the action of the battery, and will form hydrochlorate of iron, which, being combined with the hydro-

* From the Journal of the Society of Arts, No. 314.

chlorate of ammonia of the solution, will become a bichloride of ammonia and iron; if a copper plate be placed at the opposite pole and likewise immersed, the solution being properly saturated, a deposit of iron, bright and perfectly smooth, is thrown upon the copperplate, from this principle:—

Water being composed of hydrogen and oxygen.

Sal ammoniac being composed of

1st. Hydrochloric acid containing chlorine and hydrogen.

2d. Ammonia, containing hydrogen, nitrogen, and oxygen.

The water is decomposed under the galvanic action, and the oxygen fixes itself on the iron plate, forming an oxide of iron; the hydrochloric acid of the solution acting upon this oxide forms a hydrochlorate of iron, whilst the hydrogen precipitates itself upon the plate of the negative pole, and, unable to combine with it, comes up to the surface of the solution in bubbles.

My invention has for its object certain means of preparing printing surfaces, whether for intaglio or surface printing, so as to give them the property of yielding a considerably greater number of impressions than they are capable of doing in their ordinary or natural state. And the invention consists in covering the printing surfaces, whether intaglio or relief, and whether of copper or other soft metal, with a very thin and uniform coating of iron, by means of electro-metallurgical processes. The invention is applicable whether the device to be printed from be produced by engraving by hand, or by machinery, or by chemical means, and whether the surface printed from be the original or an electrotype surface produced therefrom. I would remark that I am aware that it has been before proposed to coat type and stereotypes with a coating of copper, to enable their surfaces to print a larger number of impressions than they otherwise would do; I therefore lay no claim to the general application of a coating of harder metal on to the surface of a softer one, but my claim to invention is confined to the application of a coating of iron by means of electricity on to copper and other metallic printing surfaces.

In carrying out the invention the solutions of iron employed may be varied, and such is the case in respect to the arrangement of the galvanic battery or other source of the electric currents used; I do not therefore limit the invention to the means hereinafter described, but I believe they will be found to be the best for the purpose.

I would further remark that it is important that a ferric solution should be employed which will not dissolve or corrode the plate intended to be coated, for if it be attempted to use such a solution, though the iron will be precipitated, it will not only be in a non-coherent state, but the engraved surface itself will be liable to be attacked and injured. It may also be remarked that the coating of iron admits of being removed from a printing surface of copper without injury to the original plate, hence the original plate may, after being coated and used for some time, have the worn coating removed, and then be recovered with an iron coating as often as may be required; and if care is taken to remove the coating of iron before it has been entirely worn

away, the engraved copper or other plate may be made to print a vast number of impressions and yet remain in the original state it was in when it left the hands of the engraver, or was otherwise first produced; the only limit appears to be in the gradual change which takes place in the body of the printing surface by the compression to which it is subjected in the process of printing. Heretofore, in respect to plates engraved in intaglio, if of steel, they each yield on the average about 3000 impressions without re-touching; if of copper, they each yield on an average not more than 800 without re-touching; whilst electro casts of copper obtained from the originals will not on an average each yield even 200 impressions without re-touching; in fact such printing surfaces are so easily worn, that after the first 100 or 150 impressions, there is a considerable deterioration in the quality of the work produced. Therefore, for the supply of the number of impressions often required by art associations and others, it has been found necessary to multiply the electro casts very considerably. In such cases the invention is applicable with considerable advantage, for I find that an electro plate 40 × 22 inches, covered or coated with iron, has yielded 2000 impressions without its being necessary to remove and renew the iron coating, there being no perceptible difference between the first and last impression, the work on the plate appearing not to have suffered in the slightest degree. Hence, in future, by the application of the invention, it will only be necessary to multiply electro casts to such an extent as may be necessary to ensure the production of prints or impressions with the requisite speed on paper, calico, or other fabrics. At the same time an original engraving on copper would become, when treated according to the invention, more lasting than if engraved on steel. Although original surfaces engraved in relief, and also electro and other casts taken from them, yield a considerably greater number of impressions than those I have mentioned as obtained from plates engraved in intaglio, to which the invention has not been applied, nevertheless, the invention is applicable with great advantage to such relief printing surfaces, whether of copper or other soft metal, for if they be coated with iron according to the invention, they will yield almost an indefinite number of impressions, provided the iron surface be renewed as often as may be necessary, and the printing surfaces be again recoated.

In carrying out the invention, I prefer to use that modification of Grove's battery known as Bunsen's, and I do so because it is desirable to have what is called an intensity arrangement. The trough I use for containing the solution of iron in which the engraved printing surface is to be immersed in order to be coated is lined with gutta percha, and it is 45 inches long, 22 inches wide, and 32 inches deep. In proceeding to prepare for work, the trough, whether of the size abovementioned or otherwise, is filled with water in combination with hydrochlorate of ammonia (sal ammoniac) in the proportion of 1000 ℔s. by weight of water, to 100 ℔s. of hydrochlorate of ammonia. A plate of sheet iron, nearly as long and as deep as the trough, is attached to the positive pole of the battery, and immersed in the solution. Another

plate of sheet iron, about half the size of the other, is attached to the negative pole of the battery, and immersed in the solution, and when the solution has arrived at the proper condition, which will require several days, the plate of iron attached to the negative pole is removed, and the printing surface to be coated is attached to such pole, and then immersed in the bath till the required coating of iron is obtained thereto. If, on immersing the copperplate in the solution, it be not immediately coated with a bright coating of iron all over, the bath is not in a proper condition, and the copperplate is to be removed and the iron plate attached and returned into the solution. The time occupied in obtaining a proper coating of iron to a printing surface varies from a variety of causes, but a workman after some experience, and by careful attention, will readily know when to remove the plate from the solution; and it is desirable to state that a copperplate should not be allowed to remain in the bath and attached to the negative pole of the battery after the bright coating of iron begins to show a blackish appearance at the edges. Immediately on taking a copperplate from the bath great care is to be observed in washing off the solution from all parts, and this I believe may be most conveniently done by causing jets of water forcibly to strike against all parts of the surface. The plate is then dried and washed with spirits of turpentine, when it is ready for being printed from in the ordinary manner.

If an engraved copperplate be prepared by this process, instead of a comparatively limited number of impressions being obtained and the plate wearing out gradually, a very large number can be printed off without any sign of wear in the plate, the iron coating protecting it effectually; the operation of coating can be repeated as many times as required, so that an almost unlimited number of impressions can be obtained from one plate, and that a copper one.

This process will be found extremely valuable for electrotype plates and also for photogalvanic plates, since they can be so protected as to acquire the durability of steel, and more so, for a steel plate will require repairing from time to time, these will not, but simply re-coating whenever it is found necessary; by these means one electro copperplate has yielded more than 12,000 impressions, and was found quite unimpaired when examined minutely.

It is easy to appreciate the importance of this invention as applied to artistic or line engraving more especially, for a copperplate being once engraved, if submitted to the acierage process, will become a lasting property, not liable to deterioration by printing, and the public may expect to be supplied with the very best impressions at a more moderate charge, whilst to the numerous branches of commercial engraving, for the ceramic manufactures and others, as well as to the vast number of old engraved copperplates existing in this country, this process is likely to confer an immense additional value.

I need not say that copper is not by no means the only metal to which the process is applicable, for the same principle will be found to answer in the case of other soft metals used for printing purposes, and I shall only add, in conclusion, that although the principle of electro-

typing has been applied up to the present date in a variety of ways since it was organized by Thomas Spencer, in 1837, this is, I believe, the first time that an attempt has been successfully made to prepare an engraved copperplate with harder metal, with the view of increasing its printing capabilities, and I feel happy to have been the first to introduce so valuable a discovery into this, my adopted country.

For the Journal of the Franklin Institute.

Particulars of the Steamer Albatross.

Hull built by George Greenman & Co., Mystic Bridge, Connecticut. Machinery by the Corliss Steam Engine Company, Providence, R. I. Owners, Commercial Steamboat Company.

HULL.—			
Length on deck,		158 feet.	
Breadth of beam, (molded,)		30 "	
Depth of hold,		10 "	
" to spar deck,		10 "	
Frames, *molded*,			13 inches.
" *sided*,			10 & 12 "
" apart at centres,			26 "
Depth of keel,			14 "
Draft of water { forward,		11 "	
Draft of water { aft,		13 "	
Area of immersed midship section at load draft,		310 sq. ft.	
Tonnage,	450.		
Masts, 3.—Rig—Schooner.			
ENGINES.—Upright direct action.			
Diameter of cylinders, two,			34 inches.
Length of stroke,		2 feet 10	"
Cut off,	within one half.		
Maximum pressure of steam in pounds,	45.		
Maximum revolutions at above pressure,	75.		
BOILER.—One—Return flue.			
Length of boiler,		24 feet.	
Breadth "		10 "	
Height " exclusive of steam chimney,		10 "	8 inches.
Weight " without water,	52,000 lbs.		
Number of furnaces—two.			
Breadth of "		4 "	6 "
Length of grate bars,		6 "	
Number of flues,	{ above 14.		
	{ below 10.		
Internal diameter of flues,	{ above 12 ins.		
	{ below 6 of 15 ins. and 4 of 17		"
Length of flues or tubes,	{ above 17 ft. 6 ins.		
	{ below 10 ft. 6 ins.		
Diameter of smoke pipe,		4 feet.	
Height "		20 "	6 "
PROPELLER.—			
Diameter of screw,		10 feet	8 inches.
Length of "		2 "	
Pitch of screw,		19 "	
Number of blades,	4.		

Remarks.—Filled solid under engines. One independent steam, fire, and bilge pump. Boiler, chimney, and smoke pipe protected from com-

municating fire by felt and sheet iron. The hull is coppered. The boilers are on deck and has water bottoms. Has a poop cabin. Date of trial, December 22d, 1858. C. H. H.

For the Journal of the Franklin Institute.

Particulars of the Steamer Arizona.

Built by Harlan & Hollingsworth, Wilmington, Delaware. Intended service, New Orleans to Brazos.

HULL.—		
Length on deck,		201 feet 6 inches.
Length on deck at load line,		200 "
Breadth of beam,		34 "
Depth of hold,		10 "
" to spar deck,		17 " 6 "
Length of engine space,		75 "
Draft forward, light,		4 " 6 "
" load,		7 "
Draft aft, light,		5 " 2 "
" load,		8 " 2 "
Tonnage, { Hull,	632.	
{ Engine room and bunkers,	236.	
Area of immersed section at load draft,		228 sq. feet.
Speed in knots, { with tide,	$14\frac{1}{2}$.	
{ against tide,	10.	
Masts, 2.—Rig—Schooner.		
ENGINES.—Vertical beam—condensing.		
Diameter of cylinder,		44 inches.
Length of stroke,		11 feet.
Cut-off,		5 " 6 "
Maximum revolutions,	$17\frac{1}{4}$.	
Weight of engines,	360,000 lbs.	
BOILER.—One—Return flued.		
Length of boiler,		24 feet.
Breadth "		15 " 6 inches.
Height " exclusive of steam chests,		7 " 7 "
Weight " with water,	130,000 lbs.	
Number of furnaces,	4.	
Breadth "		3 " 5 "
Length of grate bars,		6 " 2 "
Number of flues, { above 8.		
{ below 8.		
Internal diameter of flues, { above 1 ft. $5\frac{3}{4}$ ins.		
{ below 2 ft. by 1·6 ins.		
Length of flues, { above 14 ft. 2 ins.		
{ below 15 ft. 6 ins.		
Heating surface,		1880 sq. ft.
Diameter of smoke pipe,		5 " $3\frac{1}{2}$ "
Height "		33 " 8 "
Load on safety valve per square inch,	30 lbs.	
Consumption of coal per hour,	$\frac{7}{8}$ ton.	
PADDLE WHEELS.—		
Diameter overboards,		30 feet.
Length of blades,		6 " 6 inches.
Depth of blades,		22 "
Number "	21.	

Remarks.—Frame ❙ $3\frac{5}{8}$ ins. × 1 in.—18 ins. apart; 12 strakes of

plates from keel to gunwale, $\frac{3}{8}$ to $\frac{1}{2}$ inch thick; four bulkheads. Diameter of rivets $\frac{5}{8}$ and $\frac{3}{4}$. Distance apart, 2 inches; single riveted. Depth of keel, 5 ins. Dimensions of ditto U $\frac{1}{2}$ inch plate. One independent steam, fire, and bilge pump. Flanch iron clamped around the gunwale 24 ins. in width by $\frac{1}{2}$ inch thich, with knees to each frame. Keelsons, 12; fore and aft, 20 inches high. Date of trial Jan. 1859.

C. H. H.

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*The Drinking Waters of the Metropolis.** By Edwin Lankester, M.D., F.R.S., M.R.I.

[Abridged from a paper read at the Royal Institution.]

The water used in London for drinking purposes is obtained from both rivers and springs. The Thames and the New River, and partially other rivers, supply the river water. The spring water is of two kinds. First, from surface wells, obtained by digging through the gravel which covers the London clay in the western parts of the metropolis, and into the clay itself. Secondly, from deep wells, which generally pass through the London clay and penetrate the chalk below. The surface wells receive the soakage of the water which falls over London, and the water is contaminated by the contents of cesspools, drains, and sewers. The deep wells receive their supply of water from the chalk which forms the sides of the great "London Basin." All these waters contain more or less of the following mineral constituents:—

1. *Carbonate of Lime*, of which 3 to 17 grains are contained in the gallon. The carbonate of lime is the most common source of the *hardness* of the waters of London. It may be got rid of by Clark's process, which consists in adding lime to the water. This process would greatly improve the Thames water. This plan is carried out most successfully on a large scale at Plumstead. It was recommended by the government Commissioners, on account of its "health, comfort, and economy."

2. *Sulphate of Lime*, in the proportion of from 1 to 15 grains in the gallon. It decomposes in contact with organic matters, and produces sulphureted hydrogen. Very small quantities of organic matter serve to produce this effect.

3. *Chloride of Sodium* exists in Thames water, from 1 to 4 grains in the gallon; in deep wells, from 10 to 17 grains; and in surface wells, from 20 to 40 grains. In the Thames it may be the produce of the tide; in the deep wells it is washed out of the chalk; but in the surface wells, where it is most abundant, it is derived from the animal and vegetable refuse of the houses through which it percolates. The analyses of above one hundred of these wells showed that they were all equally open to suspicion on this point.

4. *Phosphates and Silica* exist in all the London waters in small quantities.

5. *Ammonia* also has been detected in small quantities in the Thames;

* From the London Mechanics' Magazine, July, 1858.

in much larger and more appreciable quantities in the surface wells. This substance is the result of the decomposition of animal matter, and in the surface wells is undoubtedly derived from human excretions.

6. *Nitrates* result from the oxidation of the ammonia. They are absent in deep wells, exist only in very small quantities in the Thames, but in large and sometimes even dangerous quantities in surface wells. In one water, examined by Mr. Noad, above 50 grains in the gallon were detected.

The *organic* matters are not injurious when fresh or recent, but they assume certain conditions of decomposition which occasionally render them deadly. Their influence may be estimated by the case of the Lambeth and Vauxhall Water Company's supply, during the years 1848 and 1854,—two years in which cholera visited London. In 1848, both companies derived their supply of water from the Thames at Battersea, and both supplied the same district with water, and the houses supplied were equally visited with cholera.

But in 1854, the Lambeth Company obtained an improved supply high up the Thames, at Ditton. The consequence was, according to Dr. Snow's calculations, that the deaths amongst the population supplied by the Vauxhall Company, as compared with the Lambeth, was as 7 to 1; according to the most favorable view of the case, as given by Mr. Swain, it was $3\frac{1}{2}$ to 1. There is nothing to account for this difference but the larger quantity of organic impurity in the water supplied by the Vauxhall Company, which still obtains water from the more impure source. The outbreak of cholera in the Golden-square district in September, 1854, was traced to the pump in Broad street, which was subsequently found to have communicated with the drain of a neighboring house.

It appears, also, that water containing organic matter acts on lead, and thus adds another source of poisoning to its own. This had been pointed out by Mr. Noad and Dr. Medlock. Organic matters in standing water undergo a kind of fermentation, by which carbonic acid, sulphureted hydrogen, and other gases are got rid of, and nitric acid is formed. The water thus undergoes a process of self-purification. This occurred in Thames water, and accounts for the fact that ships were often supplied with water from the Thames below London Bridge. This water is dangerous to drink before or during the fermenting process.

The appreciation of small quantities of organic matters by chemical processes is a difficult process. During the evaporation of water, the organic matters are dissipated, and not all left in the evaporating basin.

The microscope is an important aid. It detects the nature of organic impurities. These consist of *dead* and *living* animal and vegetable matters. The dead consist of the tissues of animals and plants. The source of these impurities can in some instances be made manifest. Such impurities are very manifest in the Thames and surface-well waters, scarcely to be detected in the deep-well waters. The living matters consist of plants and animals. The filaments of microscopic *Fungi* have been found in impure well water. They have been detected

in several waters known to have been productive of disease. The lecturer had recorded two instances (*Quarterly Journal of Microscopical Science*, vol. iv, p. 270), and others had been published.

Amongst the living animals, the forms of *Infusoria* are most abundant. These are frequently indicative of the impure condition of water. Eggs of the higher animals are not unfrequently found in the Thames water; and some of these undoubtedly belong to those forms of *Annulosa* which find their highest development in the human body.

Many of these forms of animal and vegetable life are not injurious in themselves; but they are most numerous where there is the greatest amount of impurity, and are a measure of the greater or less objectionable nature of a water for drinking purposes. They are not present in water freshly drawn from deep wells.

From these circumstances it is concluded that the water from deep wells is most desirable and unobjectionable as drinking water; *that the water from surface wells ought under no circumstances to be drunk at all;* and that, if Thames water is used, it ought to be filtered, or, what is better, *boiled and filtered.* Boiling expels the carbonic acid from water, and renders it vapid; but its briskness may be restored by passing it through the gazogene. In the filtration of water various agents may be used, as sand, sponge, charcoal, rock, &c. The most effectual is animal charcoal, which may be introduced into any of the ordinary forms of filter. Dr. Medlock has shown that the addition of iron to water containing organic impurities precipitates them without rendering the water metallic. Water which had been filtered in contact with iron twelve months since is still quite pure, while water which has not been thus filtered shows a large quantity of impure vegetable growth.

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*Hearder's Patent Telegraph Cables.**

The invention consists of an improved mode of insulating telegraphic wires for submarine purposes, so as to lessen the inductive action usually known as a statical charge of the surfaces of the insulating sheath or covering, after the manner of a Leyden jar, which action now interferes with the operation of the simple dynamic electric current. He effects this in the following manner:—First, he covers the conductor with cotton, silk, wool, hair, flax, or other fibrous or porous substance or substances, in any of their forms, in one or more layers, previously to coating it with the insulating material, which material may be india rubber, gutta percha, or any of their compounds, or any other insulating composition; or, secondly, he coats the wire with the insulating material, and then applies any of the before-mentioned porous or fibrous substances over the insulating coat, and covers the whole again with the insulating material, and, if necessary, puts on additional alternate layers of fibrous and insulating material; or, thirdly, coats the conductor with the fibrous, porous, or textile materials in the manner described in the first process, and then applies the alternations of insulating and fibrous materials in the manner described in the second process.

* From the London Mechanics' Magazine, September, 1858.

The porous, fibrous, or textile material with which the conductor is covered, or which is inserted between the layers of the insulating medium, is better for having its porosity preserved as much as possible consistently with the required strength of the cable.

The precise mode of laying on the fibrous materials may vary according to circumstances, but he prefers to lay them on when used in the form of threads or strands in a long spiral direction; and, when more than one layer is used, each layer is better for being put on in the direction opposite to the former one; or, where economy is not a great object, they may be braided on. When in the form of tapes or strips, they may either be wrapt spirally around, or laid longitudinally along the insulated or uninsulated wire, and folded round it; the latter mode being preferable, as it gives greater strength. In all cases, he recommends the employment of a soft, adhesive insulating medium, which shall adhere to the fibrous material as well as to the surface of the more solid insulating substance used for the several castings in order to prevent the layers from sliding over each other. He does not, however, confine himself to any of these plans, but merely recommends them as among the best modes of combining the porous or fibrous substances with the insulated material.

As telegraph cables are usually constructed, the gutta percha or other insulating substance which encloses the conductor, acts the part of a Leyden jar, the internal conductor serving as the inner coating, and the water as the outer coating; and his object is to interpose a fibrous or porous substance between the wire and the insulating coating, in order to prevent the contact of the metal with the homogeneous surface of the insulating medium; and, for a similar reason, he also puts on the outer layer or layers of porous and insulating materials, viz: to prevent the water, or other external conductor, from coming in contact with and forming an external coating to the insulating sheath, which more immediately includes the conductor.

Where two or more conductors are to be embodied in the same cable, he takes the requisite number of conductors prepared in any of the ways aforesaid, and either binds them together with the porous materials before described, and then covers them with insulating medium, or unites and covers them with insulating medium at once; or he applies the porous, fibrous, or textile material and the insulating medium over the whole, when thus united, in alternate layers, as before described.

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*On the Annual Yield of Nitrogen per Acre in Different Crops.** By J. B. Lawes, F.R.S., F.C.S., and J. H. Gilbert, Ph.D., F.C.S.

In a paper given last year at the Dublin Meeting, on the question of the Assimilation of Free Nitrogen by Plants, and some allied points, the authors had stated in general terms, that the amount of nitrogen yielded per acre, per annum, in different crops—even when unmanured—was considerably beyond that annually coming down, in the forms

* From the London Chemical Gazette, No. 385.

of ammonia and nitric acid, in the yet measured and analyzed aqueous deposits from the atmosphere. The investigations then referred to were still in progress; and a desirable introduction to the record of the results would obviously be, to illustrate by reference to direct experiment, that which had been before only assumed, regarding the yield of nitrogen in our different crops. To this end, had been determined, the annual produce of nitrogen per acre, in the case of various crops, which were respectively grown for many years consecutively on the same land; namely, wheat, 14 years; barley, 6 years; meadow hay, 3 years; clover, 3 years out of 4; beans, 11 years, and turnips, 8 years. In the majority of the instances referred to, the yield of nitrogen had been estimated, both for the crop grown without manure of any kind, and for that with purely mineral manure—that is, excluding any artificial supply of nitrogen. It was the object of the present communication to give a summary view of some of the facts thus brought to light.

Beans and clover were shown to yield several times as much nitrogen per acre as wheat or barley. Yet the growth of the leguminous crops, *carrying off* so much nitrogen as they did, was still one of the best preparations for the growth of wheat; whilst *fallow* (an important effect of which was the accumulation within the soil of the available nitrogen of two years into one), and *adding nitrogenous manures*, had each much the same effect in increasing the produce of the cereal crops.

Other experimental results were adduced, which illustrated the fact, that 4 years of wheat, alternated with *fallow*, had given as much nitrogen in the 8 years as 8 crops of wheat grown consecutively. Again, 4 crops of wheat, grown in alternation with *beans*, had given nearly the same amount of nitrogen per acre as the 4 crops grown in alternation with fallow; consequently, also much about the same as the 8 crops of wheat grown consecutively. In the case of the alternation with *beans*, therefore, the whole of the nitrogen obtained in the beans themselves was over and above that which was obtained during the same series of years in wheat alone, whether it was grown consecutively, or in alternation with fallow.

Interesting questions arose, therefore, as to the varying sources, or powers of accumulation, of nitrogen in the case of crops so characteristically differing from one another as those above referred to.

It has been found that the leguminous crops, which yielded in their produce such a comparatively large amount of nitrogen over a given area of land, were not specially benefited by the direct application of the more purely nitrogenous manures. The cereal crops, on the other hand, whose average yield of nitrogen under equal circumstances was comparatively so small, were very much increased by the use of direct nitrogenous manures. But it was found that, over a series of years, only about $\frac{4}{10}$ths of the nitrogen annually supplied in manure for wheat or barley (in the form of ammonia salts or nitrates), were recovered in the immediate increase of crop. Was any considerable portion of the unrecovered amount drained away and lost? Was the supplied nitrogenous compound transformed in the soil, and nitrogen in some form

evaporated? Did a portion remain in some fixed and unavailable state of combination in the soil? Was ammonia, or free nitrogen, given off during the growth of the plant? Or, how far was there an unfavorable distribution, and state of combination, within the soil, of the nitrogenous matters applied directly for the cereal crops—those, such as the leguminous crops, which assimilated so much more, gathering with greater facility, and from different ranges of soil, and leaving a sufficient available nitrogenous residue within the range of collection of a succeeding cereal crop? These questions, among others which their solution more or less involved, required further elucidation, before some of the most prominent of agricultural facts could be satisfactorily explained.

Comparing the amount of nitrogen yielded in the different crops, when grown without nitrogenous manures as above referred to, with the amount falling in the measured aqueous deposits, as ammonia and nitric acid, it appeared, taking the average result of the analysis of three years rain, that all the crops yielded considerably more, and some very much more, than so came down to the soil. The same was the case when several of the crops had been grown in an ordinary rotation with one another, but without manure, through two or three successive courses. Was this observed excess in the yield over the yet measured sources, at all materially due merely to exhaustion of previously accumulated nitrogenous compounds within the soil? Was it probably attributable chiefly to the absorption of ammonia or nitric acid from the air, by the plant itself, or by the soil? Was there any notable *formation* of ammonia or nitric acid, from the free nitrogen of the atmosphere? Or, did plants generally, or some in particular, assimilate this free nitrogen?

As already intimated, some of the points which had been alluded to were at the present time under investigation; the authors having in this, the able assistance of Dr. Pugh. Others, it might be hoped, would receive elucidation in the course of time. There, of course, still remained the wider questions—of the original source, and of the distribution and circulation of *combined nitrogen* in the soil, in animal and vegetable life on the earth's surface, and in the atmosphere above it?

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, February 17, 1859.

John C. Cresson, President, in the chair.
John Agnew, Vice President. } Present.
I. B. Garrigues, Recording Secretary. }

The minutes of the last meeting were read and approved.

Letters were read from the K. K. Geologischen Reichstanstalt, Vienna, Austria; and Edward Miller, Esq., of St. Louis, Missouri.

Donations to the Library were received from the Commissioner of Patents, and the Statistical Society, London; the K. K. Geologischen Reichstanstalt, Vienna, Austria; L. A. Huguet-Latour, Esq., and George W. Weaver, Esq., Montreal, Canada; the Regents of the University of the State of New York, Albany, New York; Edward Miller, Esq., and the St. Louis Mercantile Library Association, St. Louis, Missouri; Cornelius A. Walborn, Esq., Pennsylvania Legislature, Harrisburgh, Penna., and from Dr. T. B. Wilson, Prof. John C. Cresson, Prof. B. H. Rand, Philip Price, Esq., and the Mercantile Library Association, Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement for January 1859, was read.

The Board of Managers and Standing Committees reported their minutes.

Candidate for membership in the Institute (1) was proposed, and the candidates proposed at the last meeting (3) were duly elected.

The Standing Committees for the ensuing year were appointed by the President, and approved as follows:

On the Library.	*On Cabinet of Models.*	*On Cabinet of Minerals.*
John Allen,	Wm. B. Bement,	Isaac H. Conrad,
James H. Cresson,	Spencer Bonsall,	John F. Frazer,
George Erety,	Wm. H. Clark,	F. A. Genth,
B. B. Gumpert,	Richard H. Downing,	Isaac B. Garrigues,
Raper Hoskins,	George C. Howard,	John L. Le Conte,
James T. Lukens,	Henry Howson,	J. P. Lesley,
Samuel Middleton,	Coleman L. Nicholson,	B. Howard Rand,
Henry K. Plumly,	John L. Perkins,	Robert E. Rogers,
John H. Quail,	Charles E. Smith,	John C. Trautwine,
Thomas S. Stewart.	Charles J. Shain.	Wm. M. Uhler.

On Cab. of Arts & Manuf.	*On Exhibitions.*	*On Meetings.*
James C. Booth,	John E. Addicks,	Wm. B. Atkinson,
Thomas Bickerton,	John Agnew,	James H. Billington,
Samuel Broadbent,	James H. Bryson,	James Dougherty,
Henry Bower,	James H. Cresson,	Henry Howson,
Robert C. Cornelius,	John M. Gries,	Washington Jones,
Edward P. Eastwick,	William Harris,	Angus F. Macpherson,
David M. Hogan,	Thomas S. Stewart,	Wm. D. Parrish,
Edward H. Ladd,	William Sellers,	B. Howard Rand,
Wm. S. Levering,	Isaac S. Williams,	Richard A. Tilghman,
Henry J. Taylor.	Thomas J. Weygandt.	Joseph K. Wheeler.

On Meteorology.

Chas. M. Cresson,	Alfred L. Kennedy,
John F. Frazer,	James A. Meigs,
Samuel S. Garrigues,	Fairman Rogers,
E. Otis Kendell,	James A. Sommerville,
James A. Kirkpatrick,	Thomas J. Weygandt,

Abstract of Meteorological Observations for December, 1858; *made in Philadelphia, Somerset, and Huntingdon Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.*

December, 1858.	PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.									SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.								HUNTINGDON, Huntingdon County. JACOB MILLER, Observer.					
	Barometer.		Thermometer.			Relative humidity.	Force of vapor.			Barometer.		Ther.		Relative humidity.	Force of vapor.			Barometer.		Ther.			
	Mean.	Mean daily range.	Mean.	Daily oscillation	Mean daily range.	2 P. M.	2 P.M.	Rain.	Prevail'g winds.	Mean.	Mean daily range.	Mean.	Mean daily range.	2 P. M.	2 P.M.	Rain and melt'd Snow.	Prevail'g winds	Mean.	Mean daily range.	Mean	Mean daily range.	Rain and Snow.	Prevail'g winds.
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	Direc.	Inch.	Inch.	°	°	Per ct.	Inch.	Inch.	Direc.	Inch.	Inch.	°	°	Inch.	Direc.
1	30·249	·423	32·2	11½	4·8	61	·129		N W.	27·889	·263	26·)	2·0	80	·170		(var.)	29·681	·370	28·3	5·0		N.
2	30·119	·132	35·0	10	2·8	90	·191	0 345	N E.	27·763	·126	39·3	13·3	100	·299	0·296	W.	29 502	·178	35·0	6·7	0·243	S.
3	29·970	·149	40·8	20	5 8	77	·260		S W.	27·701	·0(2	43·0	4·3	100	·288		S W.	29·374	·129	38·7	3·7	0·093	S.
4	29·9.3	·047	46·3	11½	5·5	78	·283	0·057	(var.)	27·586	·115	51·3	8·3	100	·403	0·264	S W.	29·284	·090	39·3	2·7	0·322	S.
● 5	29·789	·134	41·7	5	4 7	91	·244	0·042	N E.	27·503	·114	55·7	7·0	97	·530		(var.)	29·164	·119	44·7	5·3	0 008	N.
6	30·000	·211	44·7	14	5·0	40	·149		N W.	27·740	·237	40·7	15·0	68	·252		S.	29·447	·283	38·3	7·7		W.
7	29·900	·148	39·3	7½	6·0	91	·225	0·300	E.	27·583	·157	41·3	8·7	100	·238	0·145	(var.)	29·312	·135	39.3	5·0	0·257	E.
8	29·828	·151	39·0	9	3·7	91	·216	0·768	N W.	27·654	·114	30·0	11·3	89	·161	0·318	W.	29·323	·161	35·7	5·0		W.
9	30·221	·393	26·7	11	12 3	58	·100		N W.	27·964	·310	12·7	17·3	91	·080		W N W.	29·739	·416	21 3	14·3		W.
10	30·274	·150	26·0	14	3·0	52	·089		S W.	27 900	·123	22·7	12·7	62	·121		W S W.	29·675	·159	22 7	6·0		(var.)
11	30·074	·199	34·5	14	8·5	55	·130		S W.	27·785	·114	35·0	12·3	75	·208		W.	29 507	·168	29·3	6·7		(var.)
12	30·212	·138	37·5	10	3·0	65	·168		N N E	27·825	·043	37·7	3·3	66	·177		(var.)	29·617	·110	35·3	7 3		E.
☾13	29·967	·245	43 3	12	5·8	92	·286	0·565	(var.)	27·648	·177	43·3	5·7	100	·288	0·755	S.	29·377	·240	39·0	3·7	0·250	S E.
14	29·730	·237	54·2	21	10·8	93	·404	0·122	S W.	27·440	·208	53·0	9·7	100	·388		W S W.	29·082	·295	44·3	4·0	0·481	W.
15	29·668	·118	56·3	6	6·8	87	·407	0·272	S W.	27·489	·143	44·7	8·3	100	323	0·769	W.	29·107	·182	48·7	6·3	0·018	N.
16	29·983	·314	42·7	11	13·7	48	·155		N W.	27·754	·264	32·0	12·7	81	·186		W.	29·446	·339	37·0	11·7		N.
17	30·040	·057	36·7	13	6·0	52	·150		N W.	27·790	·036	31·7	1 7	80	·170		W N W.	29·522	·076	35·3	1·7		N.
18	30·195	·155	28·0	7	8 7	58	·100		N N W.	27·838	·048	30·7	2·3	90	··91		?	29·649	·127	28·7	6·7		N.
19	30 167	·120	27·7	20	5·0	67	·112		N N E.	27·732	·111	34·0	4·0	83	·221	0·194	S.	29·501	·162	31·0	3·7		S.
○20	29·829	·338	40·8	13	13·2	76	·228	0·258	(var.)	27·514	·217	38·7	4·7	83	·221	} 0 570	(var.)	29·234	·267	37·3	6·3	0·320	S.
21	29 390	·439	41·7	4	2·5	91	·254	9·864	N E.	27·168	·346	44·0	5·3	100	·323		W.	28·789	·445	41·3	4·0	0·588	S.
22	29·698	·343	41·3	11	1·0	37	·107		N W.	27·642	·474	31·3	12·7	75	·156		W.	29·283	·494	36·0	5·3		W.
23	29·807	·220	38·8	16	4·5	61	·182		S W.	27·528	·142	37·0	5·7	61	·191	0·105	W.	29·199	·193	36·7	9·3	0·009	W.
24	30·070	·284	35·0	13	8·2	46	·110		W N W	27·882	·354	25·0	12·0	100	·147		W N W	29·622	·423	33·0	11·0		N.
25	30·440	·370	29·0	16	7·3	67	·137		N W.	28 061	·180	23·3	6·3	58	·114		S E.	29·855	·233	23·0	10·0		N.
26	30 229	·211	31·3	16	2·3	52	·116	0·155	(var.)	27·810	·251	34·3	11·0	73	·181	0·458	(var.)	29·593	·263	27 3	5·0	0·187	N.
☽27	29·925	·271	41·5	13	10·2	58	·185		W.	27·727	·083	39·3	5·0	91	·234		W.	29·423	·169	41 7	14·3		W.
28	29·911	·013	39·7	13	1·8	33	·102		N W.	27·673	·054	34·3	5·0	72	·173		(var.)	29·400	·036	37·0	4·7		N.
29	29 874	·037	29·3	8	10·3	94	·150	0 430	N E.	27·438	·235	31·0	3·3	100	·181	0·558	S.	29·245	·154	32·0	5·0	0·216	E.
30	29·965	·119	28·7	6	3·3	89	·142	0 837	N E.	27·546	·122	28·7	2·3	100	·160		S.	29 372	·127	30 0	2·0	0·325	E.
31	29·752	·212	37·3	10	8·7	90	·207	0·444	N E.	27·449	·098	34·7	6·0	100	·220	0·512	S.	29 228	·144	35·0	5·0	0·167	N W.
Means	29·974	·206	37·6	12	6·3	69	·172	5·459	N34°W	27·678	·172	35·7	7·7	86	·226	4·944		29·405	·216	34·9	6·3	3·484	

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

APRIL, 1859.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Steam and its Condensation. By THOMAS PROSSER, C. E.

CHAPTER II.

Introductory and General Observations.

One chapter* has already appeared on this subject, but in consequence of the Hon. Isaac Toucey, Secretary of the U. S. Navy having appointed a Board of Engineers to examine into the invention described in Vol. xxxvi, (3d Series,) p. 88 of this *Journal*, and exemplified by a colored Plate constituting Chapter I; a few more chapters are purposed with the view of further elucidating the subject, and more fully sustaining the theory on which that invention rests.

I am as much indebted to Sir John Leslie† for remarking, that, "near the freezing point, water is scarcely a better conductor of heat than ice, but as it approaches ebullition it gains such an increase of *mobility* as to conduct heat *five* times faster than in its torpid state," as Mr. Watt was to Dr. Black ‡ when he was informed by him of the existence of latent heat. Mr. Watt wrote, § "when once the idea of the separate condenser was stated all these improvements followed as corollaries, in quick succession." I would write, when once the idea of getting rid of the air-pump was started, all these improvements followed as corollaries in quick succession; but the coincidence is rather Hibernianish, I admit.

* Journal of the Franklin Institute, Vol. xxxvi, (3d Series,) page 88.
† Leslie's Observations, &c., on Heat and Moisture, page 17.
‡ Farey on the Steam Engine, page 312. § Ibid. page 314.

I wish to show the propriety of adopting some method of examination which will give actual, practical, and not mere theoretical results, for comparison between the *effective* working of my surface condenser and any other.

This cannot be done by the application of the indicator and thermometer, for the former gives no account of its own friction, of the steam condensed in the cylinder, nor of the water which enters it in a vesicular state. The thermometer gives the temperature of the feed water, it is true, but not the quantity. They are only valuable in a comparison of two engines of the same class, but are entirely useless in comparing my method of applying and condensing steam with any other. The indicator is an excellent instrument, but not a perfect one, and is unfortunately, just now, overrated in proportion to the neglect and indifference with which it has been regarded, until very recently, although it was invented about seventy-four years ago. The consequence is, that the usual calculations of the power of steam engines is fallacious in the extreme, and *made up* of mere conceits, mostly on the authority of Tredgold, who, although a thorough practical man himself, has reduced the friction of every particle of moving matter connected with the steam engine, to a mere impracticable theory, for the difference in workmanship alone may double or treble most of the calculations, and yet not be perceptible to the most skilful engineer, without a thorough and careful examination.

Nevertheless, the steam engine itself is the veriest embodiment of a *theory* of the laws of nature as understood in the operations of vaporization, condensation, and conduction of heat. These laws must govern its actions, and every real improvement must have for its object, conformation to them, and not mere subterfuges to avoid the consequences of their violation.

Practical experience had nothing to do with the invention of the low pressure condensing steam engine as we now find it, for, the air-pump, the separate condenser, the double action, were all the mere dreams of a civil engineer who never had any experience as a *practical engineer*, as the term is now commonly understood, and yet, James Watt was a most thoroughly practical and philosophical engineer, for he put into practice that which his philosophy had conceived. Had he died when he first became acquainted with Dr. Rœbuck, his invention would have been set down as the dream of a philosopher.

It will be seen that in this view of the case the natural order is just reversed, and the physical power of steam, which rests upon a theory, is measured practically,* while the power of the steam engine itself, which is altogether a practical machine, is measured theoretically.

Complicated mechanism, too often passes for skilful arrangement, and I cannot but think, notwithstanding the high estimation in which I hold the inventive genius of Mr. Watt, that the introduction of the air-pump has been fraught with immense loss to the whole world.

Mr. Watt, himself, never obtained more than 60 per cent. of the power of the full steam. For one pound of steam at 12·572 lbs. per square inch, has a mechanical power equal to raising 56,778 lbs. 1 foot,

* By the Indicator, whether the steam is high or low pressure, and however rapidly the piston reciprocates.

and deducting from that (=2·095 lbs. per square inch for back pressure) 9463 lbs. raised one foot high, we have 47·315 to be divided by 33,000, which gives 1·434 H. P. from one pound of such steam, or 1 H. P. from ·7 lbs., but Mr. Watt obtained in effective work done but 1 H. P. from 1·156 lbs.* It is even said that he calculated to evaporate 1·7 lbs.† of water per minute per H. P., and if so, the coal consumed to evaporate it being ·1344 lbs., must have evaporated at the rate of 12·649 lbs. of water to 1 of coal, while the *calculation* is that 1 lb. of coal evaporated but 8·62 lbs.‡ of water, and 8·064 lbs. of coal per hour gave 1 H. P.; but we are far from being certain that the bushel of coal weighed no more than the 84 lbs., which it was taken at, for there has always been a looseness as to that matter, and which continues to the present day according to a recent writer in the *Journal of the Franklin Institute.* But this was an extraordinary performance and far exceeded any average, for the H. P. was nearly equal to the grinding of one bushel (60 lbs.,) of wheat per hour, with 8·064 lbs. of coal, a feat which *no* engine of the present day can equal, and yet we hear of inventions which enable steam engines to perform work equal to 1 H. P., with a consumption of two or three pounds of coal per hour, *made up* of indicator diagrams, cut-offs, governors, and steam gauges.

The indicator merely gives the data for obtaining the power developed, but it gives none for obtaining the effective power applied to a useful purpose. It tells nothing of the condensed steam and vesicular water which passes uselessly, and which is by many supposed to exceed the useful steam which enters the cylinder. That the condensation of steam in the cylinder is enormous, is proved by the fact, that although air is a very bad conductor of heat, yet no expense is thought too great to protect the outside of the cylinder from it, in cases where it tells upon the work done, and that work can readily be measured as in pumping engines. And yet, that is nothing compared with the condensation going on inside the cylinder, which is as the product of the difference of temperature between the boiler and condenser, multiplied by the area exposed to it in the cylinders. Externally, then, the exposure of the heated cylinder, is to ordinarily dry air which absorbs the heat very slowly; internally, it is conveyed with immense velocity by the steam to a surface of iron, which absorbs it *instantaneously* so long as there is any difference of temperature between them.

In the three condensers which I shall investigate, I have assigned values which I believe will always be found reasonable; for instance, I have assigned to Hall's system of condensation 18 per cent., to Pirsson's 10 per cent., and to my own 2 per cent. of steam condensed in the cylinders, which I believe is far below the truth in the two first cases. These are rough calculations, but are sufficiently accurate for the present purpose. I have selected Hall's and Pirsson's surface condensers to compare with my own, because they have both attained a position which no others have. Hall's condenser was a noble invention, but the air-pump killed it, while Pirsson's still exists in public

* Farey on the Steam Engine, page 515. † Ibid. page 577. ‡ Ibid. note on page 516.

favor most unaccountably, for although in many respects superior to Hall's, principally on account of using less cold water, yet its inability to supply itself with distilled water to make up for the waste, must cause it to follow its illustrious predecessor, as too imperfect and too complicated a machine for the present day. Any condenser which does not make ample provision for recuperating the boiler waste water in the simplest, most certain and efficient manner, is a failure.

CHAPTER III.

Tabulated facts or data, giving the main features of the theories of Hall's, Pirsson's, and Prosser's systems of condensation, with their effects upon the vaporization, condensation, and absorption of heat.

TABLE I.

	HALL.			PIRSSON.			PROSSER.		
	°C	Avg.	Diff.	°C	Avg	Diff.	°C	Avg	Diff.
Temperature of steam in the boiler, say,	110	66		140	95		198	150	
Temperature of feed water entering boiler,	22			50			102		
Coefficient of absorption—see Table II.,		364			480			700	
Temperature of steam entering the cylinder,	106	59	94	130	90	80	180	142·5	75
Temperature of steam entering the condenser,	12			50			105		
Condensing water entering,	6	10·5	9	6	28	44	6	53·5	95
Condensing water leaving,	15			50			101		
2 Differences of averages,			48·5			62			89
3 Coefficient of absorption—see Table II.		142			212			314	
Total heat in the steam entering the cylinder,	638·8			646·1			661·4		
4 Total heat in the feed water,	22		616·8	50		596·1	102		559·4

This Table is necessarily arbitrary, but is believed to be sufficiently correct for the purpose intended. The Table following is founded on the experiments of Sir John Leslie, which I have before referred to. I am not strictly justified however, in carrying it beyond the boiling point, nearly up to which I have myself proved the correctness of the theory, but surely I cannot err in carrying it much further than I have done. That theory is, that, *water at the boiling point absorbs heat five times more rapidly than it does at the freezing one.*

TABLE II.

Formula 100· + 4 for each degree Centigrade.	
Coefficient of Absorption.	Temperature.
100	0°C.
142	10·5
212	28·0
314	53·5
364	66·0
480	95·0
500	100·0
700	150·0

This Table has a most important bearing on the subject of absorption of heat by water. It shows, that the higher the temperature of

the water which absorbs the heat, the more rapidly will it perform that office. Of course it does not abrogate that other law, of difference of temperature, without which there can be neither absorption nor condensation.

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CHAPTER IV.

On Boilers and Boiler Water.

The importance of absolutely pure water in boilers cannot be too strongly insisted upon, for on that depends, not only the economy of fuel, but the durability of boilers also; for pure water absorbs heat much faster than any other, and has no perceptible effect upon *pure* iron, and therefore the metal allows the heat to pass more rapidly, to an extent which will astonish engineers when steel tubes come into vogue, as they must do sooner or later. The water indeed, in almost any state, is ready enough to absorb the heat, but when it is at all impure, the deposit from it which coats over the whole interior surface of the boiler, and more particularly the hottest parts of it, will not allow it to pass. The best boiler water becomes bad in a few hours from this cause. If water contains but 2 gr. of solid matter per gallon, (and there is no river water so pure as that) and one gallon per minute be evaporated from a boiler containing 100 gallons, the whole will contain 26 grs. per gallon in 20 hours, and that makes very bad boiler water. Blowing through, wastes fuel, but gets rid of the loose deposit, but not of the non-conducting substance which coats over every part of the boiler, nor of those most destructive ones which attack the iron and destroy it in from five to ten years, which, with pure water alone, should last at least twenty or even thirty years.

Graham says,* that the loss produced by a scale of sulphate of lime of not more than one-sixteenth of an inch thick, amounts to 14·7 per cent. He also bears witness to the fact of the great economy of fuel in the evaporation of water "from the increased results obtained with increase of pressure, and apparently due to that condition." We can now see how it is that old boilers never work so well as new ones; new boilers are always paragons (see Bourne on the Steam Engine, p. 64,) of perfection. Now a boiler which never has anything but distilled water in it, is always equal to new, and hence, although I can instantly convert my steam engine from a condensing into a non-condensing one, no fair comparison can be made between the economy of the two methods of working, unless mine is continued long enough to deposit the usual mud and scale on the boiler, so as to bring it to the usual state of a boiler working under ordinary circumstances. I claim that there is a saving of at least 10 per cent. from this cause over any other surface condenser; for, by whatever other means the boiler waste is recuperated, it just amounts to a boiler and distilling apparatus of large proportions, and whether separate, as in Ericsson's, or combined, as in Hall's and Pirsson's condensers, it is too cumbersome and complicated, and has been abandoned, for engineers will not be bothered with the working of them—they may just as reasonably be expected to keep a distillery

* Journ. Franklin Inst. vol. xxxvi, (3d series,) p. 14.

on board to make their own grog—and therefore, they pump the salt water into the boiler to its certain destruction.

From an inspection of the Tables I and II, Chapter III, it will be seen, that to evaporate the same amount of water in the same space of time, will require very different areas of heating surfaces, being inversely as the rate of absorption of heat by the boiler, that rate being in direct proportion to the difference of average temperature of the fire and gaseous products in the furnace, and the average temperature of the water in the boiler, combined with the coefficient of absorption due to the latter. The most important point however, in regard to calculating for the equivalent area of heating surface, is the total heat required to be restored to the feed water after it enters the boiler, that is to say, the difference between the total heat in the feed water entering the boiler, and leaving it as steam, or rather as entering the cylinder.

Omitting all consideration of the heat in the furnace and boiler as being an unnecessary refinement in an inquiry like this, we will assume, that 20 feet area of boiler surface is sufficient for Hall's system of working, we have for Pirsson's$=14{\cdot}657=20\ (\frac{364}{480}, \frac{596{\cdot}1}{616{\cdot}8},)$ we have for Prosser's$=9{\cdot}432=20\ (\frac{364}{700}, \frac{559{\cdot}4}{616{\cdot}8})$, independent of allowance for condensation in the cylinder, and calculated at 18 per cent. for Hall, 10 for Pirsson, and 2 for Prosser, and also independent of 10 per cent. in favor of the latter on account of supplying pure water.

Therefore,	Hall,	Pirsson,	Prosser.
Will respectively require of boiler heating surface,	20·00	14·657	9·432
Add for condensation in the cylinder, $\frac{18}{82}$, $\frac{10}{90}$ and $\frac{2}{98}$, . . .	4·39	1·646	0·199
	24·39	16·303	9·631
Deduct on account of pure water, 10 per cent.,			0·963
			8·668
Deduct also for making up for waste, 10 per ct.,			·866
			7·802

and we have in round numbers,

24′ of boiler heating surface per H. P. per Hall.
16′ " " " Pirsson.
8′ " " " Prosser.

To restore in the boiler the total heat lost in passing through the engine and condenser *without* making up for waste, but adding 25 per cent. for that and other purposes,* and to bring up the proportion to my standard of boiler heating surface, we have respectively 30′ per Hall, 20′ per Pirsson, and 10′ per Prosser of area of boiler heating surface per H. P. to put them on a par with each other.

* One of these purposes is to give a sufficient weight of water when evaporated for one H. P., in accordance with some observations which showed that more than 1 lb. per minute is required for 1 H. P., but as they are only comparative, it is of no importance whether the assumptions are strictly correct or not. They are also made on the supposition, that the same power is obtainable from the same weight of water under all the systems, thus eliminating all the saving into space occupied and fuel consumed.

The next question for consideration is the relative quantities of fuel which will be required. This will be directly as the quantity of heat to be restored in the boiler, and inversely at the *absolute power* in the steam* entering the cylinder. Therefore, assuming that Hall requires 10 lbs. of coal per hour per H. P., we have for

$$\text{Pirsson, } 8{\cdot}2798 = 10\left(\tfrac{662{\cdot}3}{752{\cdot}2}, \tfrac{58438}{62144}\right);$$
$$\text{Prosser, } 5{\cdot}1419 = 10\left(\tfrac{462{\cdot}4}{752{\cdot}2}, \tfrac{58438}{69864}\right).$$

Allowing as follows, in accordance with previous calculations.

	Hall.	Pirsson.	Prosser.
Heat to be restored as per Table I,	616·8	596·1	559·4
Condensed in the cylinder, 18, 10, and 2 per cent. $= \frac{18}{82}$, $\frac{10}{90}$ and $\frac{2}{98}$ =	135·4	66·2	11·4
			570·8
Deduct in favor of pure water 10 per ct., and another 10 per cent. for making up for waste, . .	——	——	108·4
Heat required to be restored in the boiler,	752·2	662·3	462·4

The absolute power in the steam at 106°, 130°, and 180° C. = 58,438 lbs. 62,144 lbs., and 69,864 lbs.* raised one foot.

Something is due, and no small amount either, beyond the value in mere °C. to the economy of fuel on account of the high temperature of the boiler feed water, I mean on account of the greater economy of combustion. Then there is greater, far greater facility for using the steam expansively, while the boiler itself (which is of a novel character,) is *perfectly* safe and occupies but a small space as compared with any other of equal power. As to durability also, it is unapproachable so far as can be judged of from nearly two years' experience, not the slightest deterioration being perceptible.

I shall therefore adjudge that, for full steam, the different systems require in round numbers.

10 lbs. of coal per hour per H. P. as per Hall.			
8 lbs.	"	"	Pirsson.
5 lbs.	"	"	Prosser.

If any one supposes that the amount of condensation in the cylinder is an excessive allowance, I would refer to a case where it must have exceeded 40 per cent.,† and that too, in the case of a condensing engine worked with about the same pressure of steam as under Pirsson's system. With regard to that system, however, I may be permitted to explain, that I have used the term by way of distinction, on account of the more elevated temperature of the working steam and condenser over Hall's method, rather than as recognising any real difference in the principle of operation.

(To be Continued.)

* See Journal Franklin Institute, Vol. xxxvi, (3d Series,) p. 7, for the Absolute Power of Steam.

† Journal Franklin Institute, Vol. vii, (3d Series,) page 350.

Russian Inland Navigation.

(Continued from page 162.)

System of Tykvine.—The rivers which form parts of this system are the Mologa, Tschagodvstcha, the Voltchina, the Tykvine, and the Sias.

Its construction was commenced in 1802, and the navigation was begun in 1811.

The Canal of Junction, which is at the summit level of the system, is about 4 miles long. It begins at lake Laibaidino on the Tykhvinka, traverses lake Kranpino, and terminates at the Voltchina, which flows through the lakes of Somino and Vojann to the Tschagadostcha river. The Voltchina leaves, between the Somino and Vojann lakes, the name of the Somino, and from the Vojann lake to the Tschagadostcha river it is known by the name of the Govionn.

The rivers Tykhvinka and Voltchina having been rendered navigable by means of locks, are fed by the water of the lakes Pyriatina and Dolgomostchinsky near the dividing point of the system.

The whole extent of artificial navigation from the last lock on the Tykhvinka, to the last lock on the Govionn, is 128 miles, of which 86⅔ miles are on the Tykhvinka, five miles are on the summit level canal and the lakes which it traverses, and 36⅓ miles are on the Voltchina, and the lakes through which it flows.

The locks of the Tykvine system *are of wood.* Their dimensions are conformable to those of the boats known as the Tykhvinki and Sominki boats, which carry burdens of from 20 to 25 tons, and are 65 feet long and 14 broad, with a draft of water of from two to three feet.

At the first establishment of the Tykvine system the navigation was not exempt from difficulties, because in consequence of *an error in the leveling*, too few locks were built. In this season, in the years 1812, 1813, and 1814, the deficiency was hastily supplied by a system of flood-gates. These demanded a large supply of water, and the navigation was subject to serious interruptions in consequence of injuries to the works, which were lightly built with reference to the very small fall, which they had to overcome during low stages of the water, amounting to not more than two or three feet, and were incapable of withstanding the heavy floods to which the Tykhvinka is occasionally liable. This circumstance rendered it necessary to transport a part of the cargoes by land between Tykhvina and Somino.

At present, the sluices having been gradually replaced by *locks with chambers*, the transportation of cargoes by land, between Tykhvine and Somino, has almost entirely ceased, and only occurs where the opening of the canal is retarded in consequence of a late spring.

According to existing arrangements, the boats which carry cargoes, being bound to get through in a given time, are only occupied three days in passing through the whole distance occupied by the locks on the Tykvine system, and the whole trip of 551 miles, by this water,

between Rybinsk and St. Petersburg, is made in from three to four weeks. The average cost of transportation for this distance is $8·37 per ton.

The number of boats which annually pass through the Tykvine system, is about 2460 going towards St. Petersburg, and 560 going toward Rybinsk. They take to St. Petersburg about 51,428 tons, and to Rybinsk, nearly 14,464 tons.

These cargoes consist principally of valuable merchandise, such as wheat, flour, potash, copper, hides, dye-stuffs, colonial produce, manufactured articles, &c., &c.

MARIE SYSTEM.—To this system belong the rivers Scheksna, Kovja, Vytaigra, and Svea.

In order to pass from the Scheksna into the Kovja, the boats had to traverse the Bailvagevo lake, where the navigation encounters great inconveniences, particularly at the entrance into the lake. The cargoes had to be transhipped from the river boats into vessels provided with decks; on the lake itself, adverse winds caused great delays, and during storms many vessels are lost, until these inconveniences were removed by the canal of Bailosersk, around the shore of the lake, between the mouth of the Kovja and the outlet of the Scheksna. This canal was begun, by order of the Emperor, in 1843, and finished in 1846.

The length is 40 miles and 4809 feet, the breadth is 77 feet at the surface of the water, and 56 feet at the bottom, and the depth is about seven feet.

The canal begins at the Scheksna 4⅔ miles below its head, and terminates on the Kovja a short distance above its mouth.

Considerable difficulties are encountered in navigating the first 4⅔ miles of the Scheksna, in consequence of the rapidity of the current, and the shallowness of the channel, which is also very crooked.

The point of departure of the border canal of Bailosersk, has therefore been chosen 4⅔ miles below the port of Krokhino, or the outlet of the Scheksna from the Bailogera lake. At this point the depth is sufficient, and there is a considerable expansion of the river, and a very moderate current.

The level of the canal was fixed at 13 feet above the level of the Scheksna, and six feet and a half above that of the Kovja. *Two wooden locks* have been built for their purpose at the Scheksna end, and one at the Kovja end.

The canal is fed by means of the Konnost river, *and by immense reservoirs* formed by the lakes of Lak, Asatsk, and Fle, having an area of about 11,250 acres.

Several rivulets which empty into Bailvogera lake, on the southern side, increase the supply still further by the tribute of their waters. The Maigra, the most important of them, is closed by a retaining dike. In this way the boats, avoiding Bailvozera lake, pass from the Scheksna to the Vytaigra. The Marie canal has been built to open the passage from the Vystaigra to the Kovja.

This canal, the construction of which was begun in 1799, was opened for navigation in 1810.

The Canal of Junction, established at the summit level of the system, is about five miles long, and passes through the lake Malko-Ozero.

The navigation encounters no obstacle in the Kovja in the 28 miles of its course from its mouth to lake Bailo-Ozero, nor on the Vytaigra in the $6\frac{2}{3}$ miles from its mouth at lake Onega.

As to the upper part of these rivers, that of the Kovja for an extent of $23\frac{1}{2}$ miles, and of the Vytaigra for $39\frac{1}{3}$ miles, to the Canal of Junction, they could not be rendered navigable otherwise than by a system of locks fed by the Malko-Ozero lake, which constitutes the dividing point of the system, and by the lake of Kovja, the waters of which are conducted to the same dividing point by a feeder about $6\frac{2}{3}$ miles long. The extent of the artificial part of the system of Marie from the last lock on the Kovja to the last one on the Vytaigra, is $68\frac{2}{3}$ miles. Boats lightly loaded traverse this distance in three days, and those fully charged, are about eight days in making the same trip. The locks of the Marie system *are wood* with dimensions suitable for the class of boats which make use of them. These boats are about 84 feet long and 28 broad. They draw about four feet of water and carry about 150 tons.

Among the locks on the Vytaigra *several have two and three chambers, and one has four.* The dikes established near these locks raise the water to a great height, and in particular the dike near the lock, of three chambers of St. Paul, supports a head of water 35 feet in height, and is one of the most remarkable hydrotechnical works in Europe. The river Vytaigra falls into the Onega lake, from which issues also the river Svive. In order to avoid the necessity of entering the lake, the Onega canal has been established, which, however, is not yet fully completed, for the entire distance between the mouth of the Vytaigra, and the inlet of the Svive.

Canal of Onega.—The construction of this canal was begun in 1818. The part completed is 12 miles and 3490 feet in length, and is 70 feet wide on the bottom, and eight feet deep. It extends from the mouth of the Vytaigra to the bay of the Onega lake, known as the Tchornay Pessok (black sand) bay. This part of the canal was opened for navigation in 1820.

The following circumstances have induced the establishment of this part of the Canal Onega. The Vytaigra river affords, from the city of that name to the Onega lake, with a moderate current, a channel everywhere sufficiently deep, but the mouth itself is liable, during north winds, to be obstructed with sand-bars, so that before the construction of the Onega canal, particularly in autumn, when the navigation is very active, the barks were obliged *to be towed by row-boats*, which involved very considerable expenses, and retarded the arrival of the cargoes at St. Petersburg. Besides this, the barks after clearing the river, had to turn a cape, which projected some miles into the lake, and which occasioned frequent shipwrecks. All these inconveniences are prevented by the establishment of the first part of the Onega canal.

At present the whole canal is almost finished, and it will probably be entirely so, and opened for navigation in 1852.

This second part of the canal, which was begun in 1820, after the completion of the first portion has been made for the purpose of shortening the time occupied in crossing the lake towards the outlet of the Svier, distant only 12 miles from the mouth of the Maigra, the channel of which has at all seasons a depth more than sufficient to admit the passage of barks with the heaviest loads. The distance from Rybinsk to St. Petersburg by the way of the Marie system, is 702 miles. The barks carrying loads of from 80 to 150 tons, make the trip under favorable circumstances in 40 or at most 45 days.

The canal of Bailo-Ozero has entirely removed the inconveniences encountered on the Marie system in consequence of the necessity of crossing the Bailo-Ozero lake; this system on account of the large dimensions of the barks which navigate it, the depth of the channel, and the certainty of passing through it in a fixed time, and finally, in consequence of the rapidity with which the trip is made, constitutes the best navigable communication between the Volga and the Baltic Sea.

Loaded boats at present only traverse this system in the direction towards St. Petersburg. About 1600 boats pass annually, carrying about 216,965 tons. The average cost of transportation from Rybinsk to St. Petersburg is $5·38 per ton.

By the three systems, which have just been described, viz: those of *Vishney Volotchock, of Tykvine, and of Marie*, vessels reach the Ladoga lake. For avoiding this lake three canals have been established, viz: those of *Svir, of Sias, and of Ladoga.*

Canals constructed for avoiding the Ladoga Lake.—The Svir canal is built between the mouths of the Svir and Sias rivers.

This canal was commenced in 1802, and opened for navigation in 1810.

Its level, as well as that of the Sias, *is the same as that of the Ladoga lake*, and there is, consequently, no necessity for locks.

Its length is 24 miles and 3655 feet, and its breadth on the bottom is from 63 to 105 feet. Boats can navigate it with a draft of water of about five feet. A steam dredging machine is employed for removing the deposits of earth which are formed in the Svive canal, and still more in the neighborhood of the mouths of those streams, and at the intersections of the Svive canal with the rivers of Voronona, Visika, and Pelgowka.

The end of the Sias canal, near the Volkhov river, is most exposed to the deposits, arising from the fact, that its direction is contrary to that of the current of that stream.

The Sias canal has been dug between the mouths of the Sias and Volkhov rivers.

The works were begun in 1764, and were, for various reasons, frequently interrupted. It was opened for navigation in 1802.

The level of the canal is that of the lake. Its depth corresponds to the varying height of the lake waters, so that when the lake is lowest

there is still depth enough for navigation. There is, consequently, *no necessity for locks*, and the only hydrotechnical works which are found on it, are the paths and the revetments of the banks. The canal is $6\frac{2}{3}$ miles long, and 70 feet wide on the bottom. Boats can navigate it with a draft of water of about five feet.

The canal of Ladoga is built between the mouth of the Volkhov river and the inlet of the Neva from Ladoga lake.

On the 22d of May, 1722, Peter the Great, surrounded by his ministers, generals, and senators, after having heard mass, was the first to take a shovel and begin the excavation of the Ladoga canal. He filled a wheelbarrow with earth three times, and wheeled it a considerable distance, and deposited it. The lords of the court all imitated the example of their august master.

The navigation of the canal was begun in 1731. It is $69\frac{1}{3}$ miles long, and from 70 to 98 feet wide on the bottom. It may be navigated by boats drawing five feet of water.

The canal has two arms or branches, one at its junction with the Neva, near the city of Schlusselburg, and the other at its junction with the Volkhov, near the city of Novaga Ladoga. The principal hydrotechnical works, are the locks built at each of its mouths, and seven waste weirs placed in the beds of the stream, which connect the canal with Ladoga lake.

The waste weirs keep the navigable level of the canal waters at a constant height, while those of the lake are subjected to periodical variations. It has been observed that the waters of the lake *rise during a period of seven years, and fall during as many more.* The variations in the lake level have not yet been determined exactly, but the greatest difference observed between the levels of the canal and of the lake is seven feet.

All these works have been built anew under the reign of his Imperial Majesty the Emperor Nicholas. The locks at the Neva end, and the waste weirs into the lake, are built of granite. At the Volkhov end, the locks are of brick masonry, wood being only employed for cornice, mitre, tills, &c.

The locks at the Volkhov end of the canal afford five passages for water at the same, two chambers being at the old mouth of the canal, and three at the new one. At the Neva end there are six openings, of which four are side by side at the old mouth of the canal, and two at the new one.

This augmentation of the means for passing the boats from the Ladoga canal into the Neva, has been induced by the difficulty which was experienced in the passage of boats by the old outlet of the canal into the Neva, when the wind was contrary. The mouth called the old one, at Vovaja Ladoga was established in 1761, that is to say, at a time whereof the number of systems, which at present connects the Baltic with the Caspian, only one was in existence, viz : that of Vishney Volochock, and when, consequently, all the boats which arrived at Vovaja Ladoga to take the Ladoga canal, descended the Volkhov river, from which the entrance of the boats into the locks of the old

mouth was very easy. The canal of Siass was afterwards built, forming a part of the navigable systems of Bykhvinka and Maurice. The mouth of the Siass canal at the Volkhov is below that of the Ladoga canal about two-thirds of a mile. To avoid the necessity of ascending with the canal boats against the stream, an operation which is very difficult when the wind is ahead, it has been found necessary to make a new mouth for the Ladoga canal, opposite to the point where the Siass canal enters the Volkhov.

The chambers of the locks at Schlusselburg at the new mouth, are 231 feet long, and 30 feet broad, and at the old mouth they are 175 feet long, and 30 feet broad. The chambers of the locks at the new mouth at Schlusselburg *have from four to six gates*, in order to permit the more speedy passage of small boats, such as those of the Tykhvine and Svimnki and passenger boats, and to economize water. The full length of the lock chambers is intended for floats of timber.

The Ladoga canal *is fed by means of reservoirs*. The place where the artificial reservoirs are constructed, is situated in a great morass, beginning near the city of Ladoga and ending at the Kubana river. This morass is bounded on one side by some high ground, on which passes the post road of Faroslav leading from Schlusselburg to Novaja Ladoga, and on the other by Ladoga lake. Lengthwise, this marsh is almost entirely level, but transversely it slopes towards Ladoga lake.

Before the Ladoga canal was built, the small streams flowing from the morass to the lake drained off the snow and rain water freely, but when the canal banks stopped this free flow, the water begun to accumulate in the low places, and these formed artificial lakes, which are the present reservoirs. Another sandy elevation, the Korovj Khraibet, divides this same morass in the direction of its length, into two parts, which are nearly equal. In this way the Korovj Khraibet is separated from the post road by the morass, and from the canal *by the reservoirs*.

Detailed researches into the actual condition of the reservoirs of the Ladoga canal have demonstrated: 1st, that the quantity of water which they contain, when up to their full level, as well as that in the contiguous morasses, whence they are supplied with water, estimated by means of formulas at the time of the flowing of the water over the waste weirs of the reservoirs, amounts to 1,680,700,000 cubic feet. 2d, the quantity of water which the reservoirs, properly so called, *contain, when full*, as before estimated by means of transverse profiles, amounts to 968,975,000 cubic feet. It follows from this, that the marshes contiguous to the reservoirs, when full, pour into the reservoirs a mass of water equal to 711,725,000 cubic feet, but during dry summers, the water contained in these vast morasses evaporates before the period when it is necessary to feed the canal by the water in reserve, and then, during the dry period, the marshes absorb the reserve water, and serve as conductors to a more rapid evaporation.

Admitting, from the result of experience, that in a dry time, *a layer of water two feet thick is evaporated*, there would still remain in the reservoirs about 51,450,000 cubic feet of water which may be used for the purposes of navigation.

In 1826, two steam engines were constructed for the purpose of supplying the canal with water by pumping it from the lake, *but it has not been found necessary to make use of them.* All the vessels proceeding to St. Petersburg by the three systems of Vishnii Volotchock, Tykhvine, and Marie, pass through the Ladoga canal. The weight of the cargoes transported to St. Petersburg by this canal, annually amounts to 4,098,213 tons. The weight of the cargoes sent from St. Petersburg to the interior by the Ladoga canal amounts to 19,286 tons. The number of boats of all descriptions, which pass through the canal, annually amounts on an average to 20,000.

Independently of the systems which have just been described, there are to be included among the number of the channels of artificial navigation having St. Petersburg as their centre, the following, viz: The Moscow Canal and the canal of the Duke Alexander of Wurtemburg.

The project of a water communication between the Tstra and the Sestra was prepared for the purpose of extending the navigable system of Tykhvine to Moscow, so as to furnish the means of accelerating of cargoes from St. Petersburg to the interior of Russia, and *vice versa*, and also, for the purpose of replacing by a commodious navigation, the transportation of merchandize by land, which annually takes place between Moscow and the landings of Rogatchev and Schocha (on the Volga), and also to facilitate the conveyance to Moscow of timbers and wood. The execution of this project was commenced in 1826.

The Canal of Junction between the Tstra and Sestra is $5\frac{1}{3}$ miles long. It constitutes the summit level of the system. A reservoir has been here established having a superficial area of 1968 acres, and containing about 617,400,000 cubic feet of water. Assuming that about 300 boats pass through the canal loaded with 120,500 tons, the annual expense of water has been calculated to be 134,350,000 cubic feet, and according to observations made for several consecutive years, *this quantity of water is every year renewed in the reservoir.* In case the navigation on these two rivers should exceed the estimated amount, it is proposed to augment the supply into the reservoir, by conducting to it the water of the river Khazina, and those of the lake Tiastenskoidi, which is not far from the summit.

The new navigable route is from Moscow to the Volga, $182\frac{2}{3}$ miles long, in which distance are included $43\frac{1}{3}$ miles of the upper part of the Moskwa river, 57 miles of the course of the Tstra, $8\frac{2}{3}$ miles of canal along the banks of Tstra, the summit canal $5\frac{1}{3}$ miles long, $41\frac{2}{3}$ miles of canal along the banks of the Sestra, and finally, 20 miles of the course of the Sestra, and $6\frac{2}{3}$ miles of that of Donbna.

The locks are of brick masonry *covered in some places with cast iron plates;* of these there are two on the Donbna, twenty-four on the Sestra and the canal along its banks, eighteen on the Tstra, and five on the Moskwa.

The dimensions of these locks are the same as those of the locks of the Tykhvine system, that is to say: 91 feet long and 15 feet wide. It is proposed, however, to make the two locks at the extremities of the system, that is to say, of a lock on the Donbna, on one of the

canals which circumscribes Moscow, of larger dimensions, in order that the larger arks which navigate the Volga between Tver and Rybinsk, and those on the lower port of the Moscowa, between Moscow and Kolumna, may pass through these locks and discharge their cargoes at the landing established above them, so that they may be carried further by the Tstra and Sestra.

For this purpose the Donbna lock has been made 154 feet long and 30 feet wide, in order that the barks of the Volga may pass it, and that of the canal around Moscow has been made 210 feet long and 42 feet wide, so as to conform to the dimensions of the arks, which navigate the Moskva river. This lock, called Kvasnoi Kholm, has two chambers, the total lift being $12\frac{1}{2}$ feet, which is the difference of level between the canal of circumference and the Moscow river at its low stage.

In this way the canal around Moscow, dug from one part of the river to the other through a marshy flat, serves as a junction between the navigation of the Sestra, Tstra, and the upper part of the Moskva, and that coming from the Oka, and traversing the lower part of the Moskva, which formerly terminated at the stone bridge near the Kremlin.

The cost of establishing the new water communication between the Volga and the Moskva, including that of constructing the locks on the upper part of the Moskva, and the canal around the city of Moscow is $3,000,000. In the sequel this project having undergone important modifications, the works have been stopped, and at present a new project is being prepared for this important route.

The canal of the Duke Alexander of Wurtemburg is built between the Scheksna, which forms part of the system of Marie and lake Kubinsk, from which issues the Sukhona, a tributary of the northern Dwina.

This canal was commenced in 1823, and opened for navigation in 1828.

It leaves the Scheksna at a point $6\frac{2}{3}$ miles from the city of Risilof, and passing through the lakes Siversk, Babyai Zavnlomsk, Vasirinsk, Lirhemsk, and Blazvoraistchensk, terminates at the river Porosovitza, which falls into the lake Rombensk.

The different sections of canal have together a length of about $10\frac{2}{3}$ miles, and the distances through the different lakes make in all about $8\frac{2}{3}$ miles.

Two small rivers, which serve to join some of these lakes, and the Porosovitza river taken together, have a length of about $26\frac{2}{3}$ miles.

Thus the entire artificial system of the canal of the Duke Alexander of Wurtemburg is about 46 miles long.

The summit level, or dividing point of this system of navigation, is the lake Vasirinsk.

From this the other lakes are stretched out both on the side of the Scheksna, and on that of the Porosovitza.

The passage from one lake to another, and that into the Scheksna, as well as the navigation on the Porosovitza, are effected by means of locks. These locks *are of wood*, with dimensions similar to those of the locks of the systems of Marie.

The boats or arks which navigate this canal, carry about 150 tons. They draw about four feet of water, and are 84 feet long and 28 feet broad.

Although the canal of the Duke Alexander of Wurtemburg has not upon it so active a trade as the other systems of navigation, nevertheless it now passes 130 boats going towards the Scheksna river, and 50 going towards the Rombensk lake. The cargoes going towards the Scheksna, each season, amounts to about 13,000 tons, and those going towards the Rombensk lake to 1000 tons.

(To be Continued.)

For the Journal of the Franklin Institute.

On the Efficiency of the Steam Casing or Steam Jacket in Steam Engines. By Gordon McKay, Esq.

The importance which the steam engine has assumed in the industrial affairs of the world, its universal use, the amount of money daily expended in keeping its strong arm in motion, and the extent to which it affects the interests of every member of society, render any investigation of its principles, whereby new features are developed, or old, and partially neglected ones resuscitated, and shown to be valuable, of importance sufficient to excuse me for seeking a space in the pages of your valuable *Journal*, to lay before the public the results of some experiments, made with the view of testing the efficiency of the "steam casing," or "steam jacket," on the cylinder of the steam engine.

I was led to these inquiries by noticing the almost universal neglect of this principle, in this country, particularly in non-condensing engines, and by the equally universal application of it to the Cornish condensing engines in England, where the highest economical results have been attained, and this question suggested itself. Is the steam jacket economically applicable only to the condensing engine ?

It may be well here to describe what the steam jacket is. Although the history of the steam engine, and its various parts, have now become almost as familiar as household words to the engineer, there may be some who will read this article, by whom the term is not understood. The "steam jacket" was an invention of Watt's, and forms the first claim in his patent of 1769, the principles of which he describes in the following words: "First, that vessel in which the powers of steam are to be employed to work the engine, which is called the cylinder in common fire engines, and which I call the steam vessel, must, during the whole time the engine is at work, be kept as hot as the steam that enters it. First, by enclosing it in a case of wood or any other materials that transmit heat slowly. Secondly, *by surrounding it with steam or other heated bodies, &c.*" This he did by making the cylinder of his engines double, or one cylinder within another, the space between them being filled with steam taken from the boiler, and having its full pressure and consequent temperature. The outside cylinder was encased with wood, or other non-conducting substance, to prevent loss of steam in the jacket.

There are many engineers of high standing, who deny the efficacy of the steam jacket, and consider protecting the cylinder by non-conductors, as the utmost limit to which it is possible to carry economy in this direction; and they argue with some plausibility, that the cylinder will require just as much steam to keep it at a certain temperature if heated from the outside by a jacket, as it will if heated by the steam used in the cylinder to propel the machinery, while the jacket, necessarily having a greater radiating surface, will radiate more heat externally, and hence prove a positive injury. To ascertain the economy of the steam jacket, to what extent it is economical, and for what reason it is so, was the object of my experiments.

With this view, I had a small steam engine and boiler made. The boiler was a vertical one, about two feet in diameter, and six feet high, having an internal fire box and tubes. The engine was attached to the boiler, the cylinder being at its upper end, and placed above the water line in the boiler; and the shaft and balance wheel below. The valve is what is known as the lap valve, so arranged as to cut off the steam at one-half stroke. The cylinder was two inches in diameter, and the stroke eight inches; it was jacketed, and steam conveyed from the boiler to the jacket by a pipe, and the water condensed in the jacket, carried back to the boiler by another pipe, discharging below the water line into the boiler. Cocks were so arranged in these pipes that the steam could be cut off from the jacket altogether, or be admitted to it, and the condensed water returned to the boiler, or be taken from the jacket in a vessel and not returned to the boiler.

A dynamometer was applied to the balance wheel to measure the power, and a counter attached to the engine shaft to record its revolutions. A glass water gauge indicated the height of the water in the boiler, and a graduated scale on the gauge, the weight of water that the boiler contained. This scale was adapted to the expanded state of water at a temperature of 342°. The reservoir which supplied the force pump, was placed on a platform scale, and the water taken from it to the boiler carefully weighed. The boiler had also a steam pressure gauge, and during the experiments, the pressure was maintained at 115 pounds with great accuracy. The exhaust steam of the engine was used to make the draft, which was regulated by a closely fitting door in the ash pit, by adjusting which, the steam pressure could be regulated with great facility, a variation of one pound either way from 115, would cover the errors arising from that source. The cylinder of the engine was encased outside the steam jacket, with cotton about four inches thick; and during the experiments the safety valve was not allowed to lift.

The engine, when completed, was kept in motion for about fourteen days, in order to get it in such a state that its friction and leakage would remain constant during the experiments; and care was taken that the oiling should be alike in each case.

The first experiment was made with steam in the jacket, the condensed water being returned to the boiler.

The pressure on the boiler was . .	115 pounds.
The initial pressure in the cylinder was . .	95 "

(This was obtained by indicator diagram).

The weight on the dynamometer scale, $7\frac{1}{2}$ pounds, corresponding to about 1 horse power.

The duration of the experiment, . .	8 hours.
The revolutions made, . .	97,440
The water evaporated from the boiler, .	485 pounds.

By a subsequent experiment, the water returned to the boiler from the jacket, was ascertained to have been 15·7 pounds for the 97,440 revolutions. Making the whole water evaporated, 500·7 pounds.

The second experiment, without steam in the jacket, was continued eight hours, but the number of revolutions was a little less than in the first case, and the results as to water evaporated, have been corrected to correspond with the number of revolutions in the first experiment, to facilitate comparison.

The initial and boiler pressures, the same as before.

Weight on dynamometer the same.	
Duration of experiment, . . .	8 hours.
Revolutions (corrected), . .	97,440
Water evaporated, . .	630 pounds.

These experiments were then repeated with sensibly the same results.

From a measurement of the size of the steam ports, clearance, and fill, of the cylinder, a computation of water (as steam) required to supply the engine for 97,440 revolutions, with 95 pounds pressure, gives 321 pounds. Hence, in the first experiment we have the following:

Revolutions, . . .		97,440
Initial pressure, . . .		95 pounds.
Boiler " . . .		115 "
Water used in the engine, as computed, .	321	
" condensed in the jacket, . .	15·7	
" used in leaks of joints, boiler, &c.,	164·0	
Total water evaporated, . .		500·7 "

In the second experiment (without jacket), we have,

Revolutions, . . .		97,440
Initial pressure, ...		95
Boiler "		115
Water used in leaks of joints as before,	164	
" used in the engine, . .	466	
Total water evaporated,	630 pounds.	

From the above it is evident that the water used in the engine and jacket was . .	321+15·7=336·7	"
While in the second, without jacket, the water used was .	466	"
Showing a saving by the jacket of . . .	129.3	"
Or if the leaks be added, the result is the same,	336·7+164=500·7	"
	466·0+164=630·0	"
Difference, . . .	129·3	"

I think this result clearly shows the jacket to be economical, and in this instance the economy amounts to a saving of 129 in 466 of the

necessary quantity of steam, if there had been no leaks; or of 129 in 630, with leaks to the extent of the present case, or about 27 per cent. without leaks, and about 20 per cent. with leaks.

The question now arises, will this ratio hold good in all cases, and upon what principles is the saving by use of the jacket, or rather the waste (condensation), for the want of one to be computed.

Let us trace the action of steam through one revolution of the engine. The valve is opened, at the commencement of the stroke, and steam enters the port, and space between the cylinder head and the piston; all the surfaces surrounding these spaces are at a lower temperature than the steam, and a portion of it is condensed by imparting its heat to the surrounding surfaces. The piston now begins to move, and as it passes onward exposes new condensing surface to the steam, and more is condensed, and this process continues until the cut-off valve closes, and expansion of steam commences in the cylinder. At this point the cylinder is to a certain extent, in the same condition as the boiler, containing steam and water, and as the piston advances and the pressure is decreased, the water in the cylinder is again converted into steam, and thus if the expansion is continued long enough, the whole condensed water is re-evaporated. The exhaust valve now opens, and the return stroke of the piston is made, with a temperature of steam corresponding to the exhaust pressure. From these considerations, I think it evident that condensation will be as the *extent of condensing surface up to the point of cut-off, and as the number of revolutions*, it will also doubtless be effectual by the difference of initial, final, and exhaust temperatures. Precisely what effect these temperatures will have, I am at present unable to state, my experiments extending only to pressures as stated before.

The steam condensed in the cylinder of a steam engine, has been heretofore stated as a certain per cent. of the steam used, and attempts have been made to ascertain that per cent. for different degrees of expansion; but it is evident that if the condensation depends upon the condensing surface, no per centage of the steam used can be given which will apply to cylinders of all sizes; as the ratio of condensing surface, to the capacity of the cylinder, will vary in almost every engine. Let the condensation then be computed per square inch per stroke, and in the present instance it will be found thus: The whole condensation is given as 129·3 pounds, or 3581 cubic inches, which divided by the number of strokes, 194,880, is ·01837, this divided by the square inches of condensing surface which was rendered non-condensing by steam in the jacket, 23·55, gives the quantity as ·00078 cubic inches of water condensed by each square inch of unjacketed surface in the cylinder at any stroke of the piston; and this may be considered as correct for engines having initial and exhaust pressures corresponding to the one experimented upon, viz: initial, 95 pounds, and exhaust 17 above a vacuum.

In addition to the above method of ascertaining the condensation, I have obtained nearly the same result from a locomotive, where I had an indicator diagram taken with nearly the same initial, and exhaust

pressures, and where the condensing area, and dimensions of the cylinder were known. The excess of water in the state of steam in the cylinder at the end of the stroke, above that at the point of cut-off, as shown by the steam pressures at these points, amounted to ·0008 cubic inches per square inch of condensing surface; a quantity a little greater than that obtained in the experiment, yet so near as to be corroborative. It may here be remarked, as illustrating the truth of the assertion, that the condensation is as the surface and as the strokes, and not a per cent. of the quantity of the steam used, that the ratio of condensing surface to the contents of the cylinder, was in the experimental engine, as 14 to 35, while in the locomotive it was as 16 to 12 and the revolutions as 200 to 168.

The next inquiry that suggests itself is, how can this saving in the use of the jacket be accounted for? I think the answer will be found in the fact, that if heat be taken from the steam inside the cylinder to maintain its temperature, the only heat that is available for that purpose, is the sensible heat, that is, the difference of the temperatures due to the initial, and final pressures; or in the experiment cited before $328°—220° = 108°$, $328°$ being the temperature of steam at 95 pounds pressure, and $220°$ that of steam at 17 pounds pressure. It may at first seem that the latent heat is applied to heating the cylinder, inasmuch as the steam is in part condensed, as shown by the diagram of the locomotive cylinder, and therefore its latent heat must be evolved. But it also seems from the locomotive diagram, that the same water was reconverted into steam, thereby resuming its latent heat, hence the sensible heat is all that remains in the cylinder. While if the steam is used in the jacket, the latent heat is applied to the cylinder, and this amounts in the present instance to $1202°—342° = 860°$, $1202°$ being the total heat in the steam, and $342°$ the temperature of the water that was returned to the boiler from the jacket. If this solution of the question is correct, the product of the condensed water inside the cylinder, multiplied into the temperature assigned to it, should equal that of the water in the jacket, multiplied into its temperature, or $129·3 \times 108° = 13{,}964$, which should equal $15·7 \times 860° = 13{,}502$. The result is not exact, but sufficiently so to induce considerable confidence in the theory.

The preceding experiments and deductions are not by any means sufficient to enable me to determine fully the laws which govern the condensation of steam in a cylinder, they only fix one point for one degree of expansion, and one final and initial temperature, and in order to a full investigation of this interesting subject, more extensive experiments are necessary. They are however sufficient to show that the steam jacket is not a mythe, but has a real value which can be accounted for on sound principles, and also that it is advantageously applicable to non-condensing as well as to condensing engines.

Remarks.—*Hirn's Experiments on the Steam Jacket.*

The interesting communication of our correspondent, reminds us that we have had lying upon our table for some months, a long memoir

upon the subject of the steam jacket, communicated to the Industrial Society of Mulhouse, by G. A. Hirn, and read before that Society, on 25th April, 1855.

The experiments of M. Hirn were tried upon an engine of Woolf's construction (double cylinder with expansion and condensation), and each experiment lasted a day. The machine, with its jacket in action, with a pressure of 3·75 atmospheres in the smaller cylinder, gave 104 horse power ; when the jacket was not used, with the same pressure, and all other circumstances the same, it gave 79·5 horse power ; showing a gain of 23·5 per cent., which agrees very well with the results of our correspondent.

We propose, when we can find leisure, to condense the very valuable memoir of M. Hirn for our readers. In the mean time we give his conclusions.

1. The steam jacket produces a saving of power of 23·5 per cent. in a condensing and expanding engine.

2. The jacket does not act by avoiding the external loss of heat.

3. It owes but a small part of its useful effect to its power of drying the steam.

4. It owes but a small part of its useful effect to the excess of expansion of the vapor (acting as a gas), from the greater heat of the walls of the cylinder.

5. When saturated steam expands without additional heat, it is partially condensed; *and the prevention of this condensation is the origin of the economy of the steam jacket.*

6. The actual economy of fuel produced by the steam jacket is but 22·2 per cent., and not 23·5 per cent., as was deduced from the comparison of the powers.

7. No other practical means has yet been found to replace the action of the steam jacket.

He recommends as secondary means of increasing the useful effect of the engine :

First, to surround the steam jacket with the smoke flue, as suggested by M. Dollfus ; and

Secondly, to keep always the steam in the boiler, and consequently that in the jacket, at the highest pressure possible.

On an Improved Construction of Axle-boxes and Coupling-rods for Locomotive Engines. By Mr. William A. Fairbairn.*

[Read before the Institution of Mechanical Engineers.]

This construction of axle-box has for its object the introduction of an elastic cushion or spring of vulcanized india rubber between the axle-boxes and framing of locomotive engines, for the purpose of allowing the wheels to accommodate themselves to curved portions of the railway, and thus to diminish the wear on the flanches of the wheels and on the faces of the axle-boxes. The india rubber spring is placed in recesses formed in the jaws of the horn plates upon each side of the axle-box, and a metal plate, with a smooth case-hardened surface, is

*From Newton's London Journal of Arts, February, 1859.

interposed, upon which the axle-box slides vertically with the inequalities of the road. The force of the spring-action of the india rubber is made sufficient to keep the axles of the wheels at right angles to the straight portions of the railway, but to yield to the friction of the rails upon the wheels in curved portions, and by this means to allow the axles to assume such a position as will place the wheels at a tangent to the curve. The elasticity of the india rubber serves also to keep the axle boxes at all times in close contact with the faces of the horn blocks, so as to secure a good fit, and obviate the necessity for that constant lining which they ordinarily require, in consequence of the wearing away of the working faces.

That the leading and trailing wheels may have still further flexibilty of adjustment, a small play is permitted to the axle-box laterally, in the direction of the axle, by making the recesses in the axle-box, which receive the face-plates, wider than the plates themselves by $\frac{1}{2}$-inch. But to keep the axle-boxes in position in straight portions of the road, these plates are made wedge-shaped in plan, so that the elastic pressure of the india rubber on the face-plates restores the axle-boxes to their central position, whenever the pressure on the flanches of the wheel is relieved. The inclination of the wedge is made such that $\frac{1}{4}$-inch movement of the axle-box laterally, in either direction, compresses the india-rubber $\frac{1}{8}$-inch.

The india rubber is employed in the form of rings or washers $\frac{13}{16}$-inch thick; and it is found convenient, in order to maintain an accurate fit between the working surfaces of the axle-boxes, that these washers, when in position, should be compressed $\frac{3}{16}$-inch, which is equivalent to a pressure of about 1 ton on each side of the axle-box, tending to maintain the contact of the working surfaces. With this pressure, the axle-boxes slide more freely on the case-hardened surface of the plates, than in the usual construction; whilst the motion which permits the wheels to accommodate themselves to the curvature of the road does not in the least increase the oscillation of the engine, and prevents the excessive wear of the shoulders of the journals and the flanches of the wheels, which are such fertile causes of unsteadiness in ordinary engines.

In the case of the driving-wheels of the engine, it is not advisable to allow so much play to the axle-boxes; and hence, whilst the admirable fit between the working surfaces obtained by the above arrangement renders its employment advantageous, it is modified in this case by the use of a band of india rubber, $12\frac{1}{2}$ by $2\frac{1}{2}$ inches, and $\frac{3}{8}$-inch thick, covered by a wrought iron plate, case-hardened as before, but not wedge-shaped, since in this case all lateral play is to be avoided. A longitudinal play of $\frac{1}{32}$-inch only is allowed on each side, between the case-hardened plate and the horn-blocks, to permit the action of the india rubber spring, which is compressed in this case, so as to exert an initial pressure of about 15 tons on each side of the axle-box, to resist the action of the force driving the engine. Notwithstanding this large pressure on the working faces of the box, it is found, in practice, to fall readily with the weight of the wheel itself. In the case of the driving-wheel, the advantage derived by this construction does not

consist in the adjustment given to the wheels, but in the perfect fit at all times maintained between the sliding surfaces; the elasticity of the india rubber also forms an elastic cushion to receive the shocks of the machinery. A small strip of leather prevents the oil from gaining admission to the india rubber. The perfect freedom of motion, the small wear of the axle-box, in consequence of the case-hardening of the slides, the ease with which the engine passes curves, and the diminished wear of the wheel-flanches, are important advantages, which have been derived, in practice, from this construction of axle-box.

A similar application of an india rubber spring to the outside coupling-rods of an engine had also been made. In this construction of rods, the use of cotters for tightening the brasses was dispensed with, by employing a set-screw at the end of the rod, secured by a lock nut, from risk of working loose.

Mr. W. Fairbairn showed a specimen of the india-rubber lining from an axle-box that had run 17,000 miles in a locomotive engine; also, a model of the axle-box fitted up with india rubber, and a specimen of one of the connecting-rod ends. He stated that it was requisite to take great care to keep oil away from the india-rubber; as in one trial, the india rubber had lasted only a month, from neglect of this precaution; but when properly protected from oil, its durability was found to be very great. A cap was now fixed over the india rubber, as a more complete protection for this purpose. These axle-boxes and connecting-rods were working in several locomotives on the Chester and Birkinhead Railway, and they were found to be now as good and perfect as when first put in, though some had run as much as 17,000 miles; they were considered quite satisfactory, and the result of the axle-boxes was an improvement in reducing the wear of the wheel flanches. The connecting rods were screwed up at the ends, instead of being cottered as in the usual manner; and this mode of construction he considered an improvement as regarded convenience and security from accident.

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*Description of an Improved Railway Switch.** By Mr. John A. Haswell.

[Read before the Institution of Mechanical Engineers.]

In the various kinds of switches now used on railways, the moving tongue slides upon the chairs, rubbing upon them throughout the extent of its motion; and the switches are made self-acting by a balance weight, hanging from the lever, and constantly pressing the tongue home to the side of the main rail. But in practice this plan is found defective; for although a weight is employed as heavy as can be conveniently worked, its action is uncertain,—being frequently impeded by the friction of the sliding tongue, from the chairs having become dry, or the oil becoming adhesive or mixed with sand and ashes. The tongue-rails are then liable to remain on the wrong side, or only partially reversed,—thus presenting both tongues open, and causing danger of accident, from wheels running off the rails, by the flanches

* From Newton's London Journal of Arts, February, 1859.

entering between the tongues and main rails at both sides. To lessen this defect, a raised strip has been used upon the rubbing part of the chairs, which reduces the surface for holding sand; but this plan involves the objection of the oil being sooner rubbed off by the motion of the tongue, from the increased pressure between the rubbing surfaces. The large consumption of oil that takes place with the ordinary switches, forms a serious item of expense,—most of the oil that is applied being unavoidably wasted.

The new construction of switches described in the following paper, which is the invention of Mr. Edwin Thompson and Mr. William Nicholson, of York, is designed to remove this difficulty, by avoiding the sliding of the tongue-rails upon the chairs, and so dispensing entirely with the use of lubrication.

The tongues are of the ordinary form; but a short iron strut or link is jointed to the thin end of each tongue-rail and to the end chair, so that, when the tongue-rail is opening, this strut causes the end of the tongue to rise off the chairs, and the other tongue at the same time descends upon the chairs,—the short strut acting as a radius link. The elevation of the tongue-rail, when open, is two inches above the level of the main rails, which is found to insure the tongue-rail being properly put down upon the chairs, and closed to the main rail, and being also entirely clear from any low portions of the engines, &c.

In this construction of switches, on account of the sliding motion and friction of the tongue-rails being entirely avoided, oil is not required, and no danger can arise from sand or ashes lodging on the chairs; also, the removal of any larger fragments of coke or ballast is, to a certain extent, provided for by the altered form of the chairs, which this manner of opening the tongue-rails admits of. As the tongue-rails require no larger surface to rest upon than is actually in contact with the chairs, when they are closed to the main rail, advantage is taken of this by increasing the thickness of the chairs at the particular part upon which the rails rest, forming a raised step, which is completely covered when the tongue-rail is closed; and on the open side, the width of the tongue-rail only is exposed to the reception of rubbish,—the larger pieces thus falling off, and the smaller ones being crushed or removed by the descent of the tongue. The accomplishment of this object has been satisfactorily shown by the working of one of these switches, which has been put down in a situation where sand was constantly used for the engine-wheels, and has continued to work well, although sometimes nearly buried by the accumulation of sand.

In these switches, the ends of the tongue-rails are extended a foot beyond the sharp edge that fits against the top of the main rail; and the extended ends are curved inwards, like a check-rail end, and reduced in height $1\frac{1}{4}$ inch, to allow the wheel-flanches to pass over the top, when the tongue rail is closed to the main rail; and in any case of the tongue not being properly closed, the pressure of the wheel-flanch will tend to crush any obstructing substance upon the chairs. This action is aided by the check-rail end of the tongue on the opposite side, which in such a case will not be opened to the full extent, but

sufficiently so to guide the wheel-flanches in the proper course, and, by drawing them from the other imperfectly-closed side, prevent the wheels from taking both lines.

Some of these switches are now in constant use at the York and Newcastle stations, where they can be seen in operation.

Mr. J. A. Haswell exhibited a large working model of the new switch. Mr. J. Bourne had had one of the switches in operation at the Newcastle station for a month, and some others had been tried for about six months at the York station. These had been working very satisfactorily, and were found to have a decided advantage over the other switches in use. The others required constant oiling and attention to keep them in working order; and the oil, collecting the dust and grit, caused frequent cleaning to be necessary, to prevent risk of accident, from the switch sticking partly open. In winter, great difficulty was experienced with ordinary switches from the snow, which partially melted in the day-time, and then froze again in the evening,—causing the switch-tongue to be choked up by ice, and prevented from shutting close; and the men had to be continually using salt, to thaw the ice and keep the switches working. But these new switches were completely free from those defects, and appeared very successful in meeting the requirements of self-acting switches. No oil was used, and this effected an important saving in annual expense; and from the switch-tongues not having any sliding motion on the chairs, no inconvenience was experienced from sand and dust; and the risk of their sticking partly open was effectually prevented, as they must fall on one side or the other.

For the Journal of the Franklin Institute.

Papers on Bridge Construction. By John W. Murphy, Civ. Eng. Philadelphia, Pennsylvania.

(Continued from page 147.)

The Arch.—In the construction of arch bridges, some definite line is assumed for the *intrado*—and some other definite line also assumed for the *extrado*.

These lines are dependant upon either the taste of the engineer, or upon some necessity. In some cases it may be imperative that the *extrado* shall be a horizontal line, while the *intrado* may be any curve, according to taste. Sometimes imperative that the *intrado* shall be of that character such as will give the greatest possible area of *water-way*, at others, so that the greatest architectural effect may be produced upon the eye.

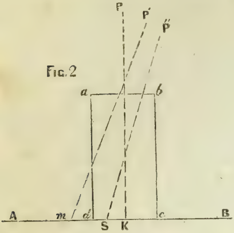
In all cases where these lines are fixed agreeably to the judgment, foresight, and discretion of the engineer, the weight of the superstructure may be approximately determined. It then only remains to give such dimensions to the *ring-stones* or *ribs*, to cut their joints in such direction as shall best satisfy the conditions of the line of *resultant pressures*.

This line requires but two conditions of satisfaction for stability, and no more.

One condition is—*That it shall be embraced or contained within the arch-stones or rib, of which the arch consists.*

The other: that it shall meet the joints of the same at a greater angle than the angle of friction of the material of which the arch is constructed.

Fig. 2



Suppose a block of granite *a b c d*, (Fig. 2,) be seated upon a plane, A B, of the same material. Let it be acted upon by a force P, in a direction parallel to the side *a d*, and perpendicular to the plane A B. It is clear that the mass *a b c d*, will have no tendency to move, but will remain in position, unless the force P, be so great that it overcomes the cohesion of the particles of the granite, when it will crush the mass.

Suppose again, that the force P, be transferred to P′, taking the direction P′ *m*, and falling without the base of the granite block; it is clear that this force will have a tendency to overturn the block about the point *d*. And again, if it be transferred to P″, taking the direction P″ S, the body *a b c d*, will have a tendency to slide upon the plane A B, in the direction toward A, and will be resisted by the friction of the surface of the granite block upon the granite surface A B. If the angle P″ S B, be greater than the angle of friction of the material, the block will remain stationary. If less, it will move toward A. This angle in practice should never be less than 30°.

Now if we suppose that the block *a b c d*, be a portion of the *ring-stone* or rib of an arch, and that the forces P, P′, P″, are the *resultant pressures*, we readily discover the truth of the statement that this line of resultant pressure, through the supporting medium of the arch, requires but two conditions of satisfaction, and no more—and hence the point to be gained in the construction of arch bridges without counterbracing, is to so arrange the weights or masses of matter, as that this resultant line shall be as near as possible at right angles to the joints. Or finding this to be impossible, to change the direction of the joints to conform to the line; or finding this also to be impossible, make the ring parts so deep, that these two conditions may be as nearly as possible fulfilled.

If the resultant pressure upon any single section of the arch, such as *a b c d*, due to the superincumbent weight above it, take the direction as shown, either in the direction P, P′, or P″, we shall have our arch the most stable possible, when that force takes the direction P, at right angles to the joint.

Failure will take place when the resultant pressure takes the direction P′, falling entirely without the ring-stone or rib, and stability or non-stability when the force P″ makes a greater angle with that joint than 30 degrees, or thereabouts.

We now arrive at the determination of the constant value of h, in Equation (2), page 147.

Let $a\ b\ c\ d, \ldots g$, be the intrado of any arch, and A B C D, . . H, be the extrado. Now since it is conditioned, (by what has already been proved,) that the weight at b and f, shall have such relation to the weight at c and e, as that the horizontal thrust $= h$ shall be the same at either point.

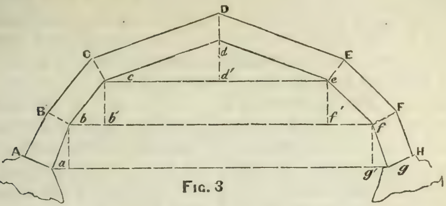


FIG. 3

It follows that the weight at the point d, which acts through the two braces, (so to express it), $d\ c \ldots d\ e$, shall have such a horizontal value that the points c and e shall be maintained in equilibrium by the equivalent horizontal thrust due to the value of the vertical weight at the point c and e.

In other words, suppose that the mass of matter in the stone A B, $b\ a$, be supposed to be concentrated at the point b, and in the same manner the mass of matter of f, F, H, g, be accumulated in the point f, and that in each instance, through the line $a\ b$, and $f\ g$.

Relieve the points b and f, from the weight of the superincumbent masses above them, and they will fall inward in the direction of the lines $b\ b'$, $f\ f'$.

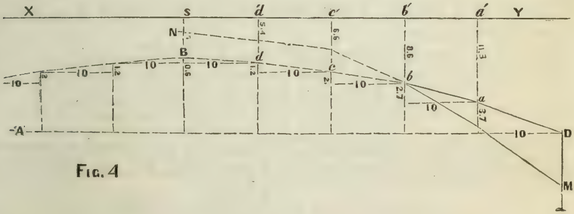


FIG. 4

Put such value to the weight at c and e as will have a horizontal thrust equal to the tendency of the two masses (accumulated at b and f), to press inward, and the points b and f remain in equilibrio.

In the same manner, let the value of the vertical weight acting at d, in the direction $d\ c$ and $d\ e$, have a horizontal component, at c and e, which must also equal that at b and f, equivalent to the horizontal value of the weight acting at the points c and b, e and f. Now the weight

acting at b, to produce h, is made up of b, c, d, and the weight acting at c, is made up of the weight c, d. And the weight acting at d, in the direction d, c, to produce h, is in fact,—The *horizontal component of the weight at the crown of the arch.*

Applying these principles to practice:

Suppose it be required to find the dimensions of the ring-stones of a proposed arch bridge, to be constructed in stone masonry.

It is decided that the span shall be 100 feet in the clear, and the rise (or versed line) 10 feet; the intrado to be the arc of a circle.

Let A, B, D, Fig. 4, be the curve of the intrado, and suppose X, Y, be the extrado or roadway, which is made parallel to A, D.

Let the distance B, S, at the crown = 5 feet.

From whence the distances d' d, . . c' c, &c., of the spandrel are determined, as shown in the cut. The value of b, Equation (2) being taken at 10 feet. If we suppose the masonry of the arch to be of the same density throughout, we shall have the weights resting upon the ring, varying directly as the dimensions marked in the spandrel.

Re-producing Equation (2) from page 147.

$$a = \frac{(K' + W' + V' \ . \ . \ . + N')}{h}\, b.$$

We have first to determine the value of h, putting the weight per cubic foot of our masonry at 170 ℔s.

And, supposing that the weight impinging upon the crown, and acting in the direction toward the point D, shall be measured by 5 feet in height by 5 feet in length, (or $\frac{10}{2}$) also multiplied by 170 ℔s., which will be sufficiently near for all practical purposes—we have $5 \times 5 \times 170 = 4250$.

$4250 : h :: 0{\cdot}6 : 10$, or $h = 70{\cdot}833$ ℔s., which will be the pressure upon the ring-stone at the crown.

The vertical weight in ℔s. upon each of the points d, c, b, a, will be as follows, viz:—

$$\begin{aligned} \text{at } d &= 5{\cdot}4 \times 10 \times 170 + 4{,}250 = 13{,}430 \\ \text{“ } c &= 6{\cdot}6 \times 10 \times 170 + 13{,}430 = 24{,}650 \\ \text{“ } b &= 8{\cdot}6 \times 10 \times 170 + 24{,}650 = 39{,}270 \\ \text{“ } a &= 11{\cdot}3 \times 10 \times 170 + 39{,}270 = 58{,}480 \end{aligned}$$

By substituting in Equation (2), the above calculated value for the sum of the weights as above indicated by K′+W′, &c., we shall have for,

$$\begin{aligned} \text{Value of } a, \text{ at } d &= \frac{13{,}430}{70{,}833} \times 10 = 1{\cdot}88 \\ \text{“ \quad “ } \quad c &= \frac{24{,}650}{70{,}833} \times 10 = 3{\cdot}48 \\ \text{“ \quad “ } \quad b &= \frac{39{,}270}{70{,}833} \times 10 = 5{\cdot}50 \\ \text{“ \quad “ } \quad a &= \frac{58{,}480}{70{,}833} \times 10 = 8{\cdot}20 \end{aligned}$$

Describing the curve from a point, N, 3 feet above the line of the intrado at the crown, and passing it to M, by the data above calculated, we obtain its direction independent of the direction in which the ring-stones should be jointed, and also independent of the number of ring-stones, or rather we should say, the line has been determined upon the supposition that the joints are vertical, and that the ring-stones have a depth of ten feet. I have taken this method of progression, in order that we might arrive more clearly to the determination of these joints, and thus show by what simple changes this line is made to pass above the intrado from B, to D, and thus fulfil the requisites of stability.

(To be Continued.)

AMERICAN PATENTS.

List of American Patents which issued from January 18, to February 15, 1859, (inclusive,) with Exemplifications.

JANUARY 18.

136. Potato Diggers; R. L. Allen, City of New York.

Claim—The arrangement and combination of the removable wings with the double mould-board. Also, the arrangement and combination of the central or dividing bar with the standard, by means of the notched fastening, as set forth.

137. Ring Lock; Wm. J. Alston, Williamson County, Tennessee.

Claim—The friction springs, arranged in combination with the inner rings of the locks.

138. Apparatus for Drying Grain, Malt, &c.; Stephen R. Andres, Troy, New York, and Samuel Andres and McDonough Bucklin, City of New York.

Claim—The use or employment of a blast or current of hot air introduced into the cylinder through a hollow journal, or its equivalent, when said current of hot air is brought into direct contact with the substance to be dried thereby, in combination with a cylinder made adjustable to any angle.

139. Syringing Apparatus; Ernst Bagniki, City of New York.

Claim—The construction of a chair containing a pump, with an arrangement of the valve chambers, in the manner specified.

140. Amalgamator; John and Edward W. Barker, Baltimore, Maryland.

Claim—1st, The combination of a set of crushing or attrition rollers with an upper and lower rubber, arranged substantially as described. 2d, Introducing an independent current of water into the amalgamator, so as to flow around the lower end of the feed-pipe, and meet and mingle with the inflowing current of material. 3d, In combination with the rollers constructing the lower rubber hollow, with openings to admit the quicksilver into the interior, for the purpose set forth. 4th, Constructing the lower rubber with a vertical passage through its centre, arranged as described. 5th, The combination of the concave plate, arranged with the rollers for the purpose of directing the inflowing current to the centre, and between the rollers. 6th, Constructing recesses on the interior of the casing over the journals, arranged substantially as described.

141. Seed Planters; James F. Beckwith and Adin G. Gage, South Alabama, New York.

Claim—The arrangement of the tooth, discharge spout, coverers, hoppers, frame piece, lever, and bar, substantially in the manner set forth.

142. Self-primer for Fire Arms; Wm. H. Bell, Washington City, D. C.

Claim—1st, The combination of the shield, plunger, spring, and screw-head, with the magazine chamber. 2d, The arrangement and combination of the pin on the piston, and slot in the shield, with the slot in the side of the hammer, for the purpose specified. 3d, The removable guard plate, as arranged and operated for the purposes set forth.

143. Sofa Frame; Peter Born, City of New York.

Claim—A complete frame of a sofa made of thin layers of wood, in the manner specified.

144. Composition for Ornamenting Glass; Jules Joseph Henri Brianchon, Paris, France.

Claim—The yellow coloring composed of resin, nitrate of uranium, essence of lavender, and the flux of bismuth; also, the orange red coloring, composed of resin, nitrate of iron, essence of lavender, and the flux of bismuth; also, the imitation gold coloring, composed of the above described orange red coloring and the yellow coloring mixed together, with additional parts of the preparation of uranium and iron; also, the variegated prismatic coloring, composed of ammoniuret or cyanuret of gold, or gold dye, turpentine, essence of lavender, the bismuth flux, and uranium; also, the mother-of-pearl coloring, composed of the bismuth flux, the flux of lead, chloride of antimony, resin, lavender, or other essence, and colophony.

145. Lubricating Compounds; Reuben R. Brown, Buffalo, New York.

Claim—A lubricator made of the ingredients and in the proportions set forth.

146. SEEDING MACHINES; W. G. Bulgin, West Jersey, Illinois.

Claim—The rotary coulter, leveler, with share attached, and harrow teeth, arranged relatively with respect to each other and to the seed box, provided with a suitable seed-distributing device, so as to operate substantially as set forth.

147. WIND WHEEL; Abner L. Butterfield, West Dummerston, Vermont.

Claim—Attaching the sails to the frames of the arms, so as to permit of a self-lateral adjustment of the same, and using the catches and slides with cords attached, for respectively locking the sails and freeing them from the locks or catches.

148. BELT CLASPS; George Churchill, Hartford, Connecticut.

Claim—The combination of the plates, pins, and screws, as described.

149. MODE OF OPERATING WINDOW BLINDS; John Clark, Williamsburgh, New York.

Claim—Attaching toothed flanches or pinions to the tenons of the slats, and having the flanches or pinions gear into a sliding rack bar placed in the stile of the blind, and actuated by the pinion and supplemental rack teeth, or their equivalents.

150. CANTEEN GUN STOCK; Samuel Colt, Hartford, Connecticut.

Claim—So constructing the stock of a gun that it shall constitute a canteen, as described.

151. BOOT-BLACKING APPARATUS; J. M. Connel, Newark, Ohio.

Claim—The concave-edged self-adjusting brush wheel, in combination with the spring foot-piece, constructed as described.

152. PLOUGHS; G. D. Cotton, Galesburgh, Illinois.

Claim—Combining and arranging together the beam, the standards, upright, lever, brace, bar, axle, and pole, said pole reaching forward and resting upon the neck yoke, in the manner specified.

153. CULTIVATORS; Jesse Cunningham, Marshall, Missouri.

Claim—Attaching the furrow shares to a swinging frame formed of the shaft, bar, and arm, placed in a mounted frame, in combination with the buttons provided with step-like projections for regulating or adjusting the height or inclination of said share frame, and consequently the depth of the furrows.

154. RAILROAD CHAIRS; Wm. M. C. Cushman, Albany, New York.

Claim—The buttress at each end of the outside jaw flanch or rib, in combination with the top or bearing surface, as described.

155. HORSE RAKES; L. S. Deming, Newington, Connecticut.

Claim—The combination of the fingers, shaft, or axle, cam, and lever, these several parts being constructed in the manner described.

156. SPOKE MACHINE; L. J. Dickason and John Frazee, Georgetown, Ohio.

Claim—1st, The described mode of operating the cutter frame with its cutters, and also the emery wheel and its frame, so as to throw them all clear of the spoke after the operation of twining and smoothing, that is to say, we claim the employment of the two arms upon the shaft, operated by means of a hand lever. 2d, The adjustable spring rests, when arranged in the manner set forth. 3d, The spring arm, spring catch, pitman, and bent lever, in combination with the lever, clutch, and rod, arranged so as to throw the pulley wheel in and out of gear with the shaft, in the manner set forth.

157. MACHINE FOR MAKING PRINTERS' RULES; Richard Doble and M. Angelo Starr, Richmond, Indiana.

Claim—The combination of the graduated plates, having arc-formed and radial graduations and guide bars, with their clamping screws and screw clamps arranged in relation to the saw, for the purpose set forth.

158. RAILROAD CHAIRS; Henry A. Landry, Camden, New Jersey, Assignor to R. G. Ransford, Troy, N. Y.

Claim—The improvement of a projecting piece of metal, either cast on the railroad chair or made of wrought iron or steel, and affixed and rising up alongside of the rails on railroads where two rails meet, and of sufficient height to receive all or a part of the weight of the machinery, while passing over that particular part of the rails, as described.

159. CAR COUPLINGS; Wm. Layland, Mixerville, Indiana.

Claim—The employment of the combined adjustable latch and catch, when constructed substantially as described.

160. VENTILATING REGISTERS; Joseph Leeds, Philadelphia, Pennsylvania.

Claim—In combination with a register, the hanging of a valve by its centre, so as to make said valve a regulator or cut-off to the ascending current of air, from N to M, and at the same time a regulator of the ingress or egress of air to or from an apartment, and thus causing a register to serve the purpose of a ventilator, as described.

161. MACHINE FOR BENDING UMBRELLA RIBS; Ferdinand Lehr, Hoboken, New Jersey.

Claim—1st, A reciprocating pincer, taking the wire from a fixed and drawing the same through the machine, dropping said wire, and then returning below to its previous position, so as to be out of the way of the bending or coiling of the wire into eyes or loops. 2d, Attaching said pincers and traveling carriage by one side thereof, while the power for sliding said pincers lengthwise of the machine is applied to the other jaw, whereby the clamping and releasing of the wire is effected by the act of moving said pincers. 3d, Attaching one end of said pincers on a stud or shaft, in combination with the stops, spring, and slotted connecting link, whereby the sliding, clamping, depressing, and elevating motions are given to the pincers by the reciprocations of said rod. 4th, The shear receiving the compound motion set forth from the cams, in the manner specified. 5th, The clamping levers, in combination with the ledges and shafts that press against and hold the wire while the loops are being formed. 6th, The mandrels, in combination with the turning shafts and stubs, when the said mandrels are projected from the blocks, or their equivalents, for the wire to be bent around the same, to form the loops or eyes in the spokes or ribs, and withdrawn from said eyes when the same have been bent. 7th, The arrangement of the sliding bar and the connexions therefrom to the clamping levers and slides, whereby the clamps and mandrels are simultaneously actuated. 8th, The sliding stocks carrying the shafts and turning stubs, for allowing the withdrawal of said stubs out of the way of the traveling pincers, and in combination therewith the bar and connexions therefrom to said stocks for communicating endwise motion to said stocks. 9th, The sliding mandrel and turning shaft connected, in combination with the jaws, or their equivalents, for turning the eye or loop in the end of the spoke or rib. 10th, The arrangement of the cranks and slotted connecting rods for communicating motion successively to the slides, and from the same to the turning stubs or loop formers.

162. MILK COOLERS; Jacob Mansfield, Jefferson, Wisconsin.

Claim—The portable milk cooler, when constructed in the manner set forth.

163. HEMP BRAKES; Richard Mansley, Philadelphia, Pennsylvania.

Claim—Operating the slide with its transverse bars by the cam, arm, and spring, when arranged substantially as described, and when the said spring is so graduated that the slide shall instantly recede after reaching the limit of its outward movement.

164. MACHINERY FOR TARRING OAKUM; Richard Mansley, Philadelphia, Pennsylvania.

Claim—The perforated vessel, or its equivalent, placed within a stationary vessel, which contains the compound for tarring oakum, a jet of steam being admitted to the stationary vessel, while a reciprocating motion is imparted to the perforated vessel.

165. HORSE SHOE MACHINE; B. A. Mason, Newport, Rhode Island.

Claim—The combination of the four hammers, arranged in pairs, the two constituting each pair being mounted to strike simultaneously and in opposite directions, and the two pairs working at right angles with each other, or nearly so. Also, the employment of an elastic bush in the connexion of the hammers with the cranks, by which they are operated.

166. HOLDERS FOR LAMPS; Charles Monson, New Haven, Connecticut.

Claim—The mode or means of counterbalancing the system of levers or lazy tongs, or the same and one or more articles suspended from or supported by them, and this, whether the counterbalance weight be applied, so as to push or pull on the levers of the lazy tongs. Also, the method of steadying the tube or rod, or its equivalent, suspended or extending from the lower termination of the system of crossed levers or lazy tongs, viz: by the collar or slide, the levers, and the connexions, applied to the part, and the lazy tongs, and made to operate essentially, as specified.

167. CONSTRUCTING A COMBINED STREET-PAVEMENT RAILROAD TRACK; Richard Montgomery, City of New York.

Claim—A combined street-pavement and railroad track, constructed substantially as described.

168. REVOLVING FIRE ARMS; Henry S. North, Middletown, and Edward Savage, Cromwell, Connecticut.

Claim—1st, The employment of the movable cylindrical bushing-rings or thimbles, applied substantially as described, within cavities formed in the front portions of the chambers of a rotating chambered-breech, which has a longitudinal movement to operate and be operated upon, in combination with a valve-like seat, which is formed upon the rear of the barrel. 2d, The combination of the slide working in the bottom of the cylinder frame, and the double-jointed trigger-guard, part of which constitutes, also, a part of the lever, through whose agency the rotation of the cylinder and cocking of the hammer are effected.

169. WASHBOARD; John K. O'Neal, Kingston, New York.

Claim—The flexible rubber combined with the washboard, so that its upward movement shall be assisted by a spring, or its equivalent.

170. COLORING AND CURING TOBACCO-STEMS; Benjamin Payn, Albany, New York.

Claim—Coloring and curing tobacco-stems at one operation, by subjecting them to the action of steam.

171. CLOTHES SPRINKLER; Thomas Payne, Ridgefield, Connecticut.

Claim—A clothes sprinkler having an interior self-closing stopper, and made in the manner set forth.

172. FURNACES; Samuel Pierce, Troy, New York

Claim—The series of detachable or removable heat-radiating plates constructed with points or stems, projecting from their surfaces, both of the surfaces being radiating surfaces, in the manner described. Also, in combination with a horizontal fire-box and fire-chamber, and the outer casing, a series of plain heat-radiating plates, or a series of corrugated heat-radiating plates.

173. CARPET-SWEEPER; Samuel F. Pratt, Roxbury, Massachusetts.

Claim—In combination with the case and the rotary brush of a carpet-sweeper, a serrated or toothed clearer applied so as to cleanse the brush, during and by its revolutions. Also, the arrangement of serrated or toothed clearers on opposite sides of the brush, in order that it may be cleansed while being rotated in either direction. Also, the arrangement of the serrated clearer in the case of the carpet-sweeper, in such manner that the said clearer shall form part of, or be maintained by, the dust receptacle. I do not claim the application of a single elastic-tired driving-wheel to the driving-wheel affixed on the brush-shaft; but claim the arrangement of two of the elastic-tired wheels on opposite sides of the driving-wheel of the brush-shaft, as described, and so applying the said shaft in the case and to the fork of the handle, as to enable the brush-wheel to be forced in close contact with its drivers, not only when the machine is moved in either direction, but by the force exerted through the handle, and to so move the machine, the same insuring the rotary motion of the brush, whenever the machine may be in the act of being moved on and over a carpet.

174. MODE OF ATTACHING THILLS TO VEHICLES, &c.; R. P. Brindle, Coventry, New York.

Claim—The flanch on the bolt or pin, so made and inserted that it cannot be removed when the joint is varied from the position in which the bolt is introduced.

175. COUPLING GUN STOCKS WITH PISTOLS; Samuel Colt, Hartford, Connecticut.

Claim—The neck piece with its projecting end passing under shoulders in the lock frame, in combination with the holder pins and clamping bar, arranged as described.

176. FILE HANDLES; Wm. W. Draper, Greenfield, Massachusetts.

Claim—The centralizing socket or socket piece and spring, in combination with the handle and the fastening jaws and their operative mechanism, applied within the said handle.

177. BATHING APPARATUS; Charles Escudier, Pattersonville, Louisiana.

Claim—The application in bathing apparatus of two boilers and steam pipe connected thereto, affording, when united, an apparatus for the application of whatever kind of bath that may be desired.

178. OX YOKES; James D. Foster, Montgomery, Alabama.

Claim—Constructing the bows of four parts, a a, b b′, the parts, a a, being permanently attached to the stock, and the parts, b b′, attached by hinge joints to the parts, a a, and provided with a fastening, substantially as set forth.

179. MACHINERY FOR MOVING RAILROAD CARS ON RAILWAYS; Ambrose Foster and Harvey Brown, City of New York.

Claim—1st, The rope supporter, constructed in the manner set forth. 2d, The sliding rods with the coiled

springs attached, or their equivalent. 3d, The grab or catch, constructed in the manner and for the purposes set forth.

180. VEGETABLE CUTTER; J. Fraser, Rochester, New York.

Claim—The combination of the eccentric rod, arranged as described, with the pivoted or adjustable bed which bears the knife.

181. CATTLE PUMP; Hugh Gerred, Sparta, Illinois.

Claim—The arrangement and combination of the guides and bucket, the latter having a valve, clasp, and spring, the trough, platform, and wheels, as described.

182. STEAM VALVE; Henry Goulding, San Francisco, California.

Claim—1st, Supplying the working cylinder of the engine or machine at each successive stroke with its impelling gas or vapor from reservoirs previously charged therewith, and under the control of a valve or valves, the same serving as a substitute for a cut-off to work the gas expansively. 2d, Operating a valve in part or in whole by the gas or steam, at full pressure, from the supply pipe acting to propel it in the one direction, when the same is used in concert with an opposing force to the valve, produced by the expansion of the gas in its passage to or performance of its work. 3d, The combination of the valve and valve cylinder or case with its reservoirs, and the several inlets or outlets for action together, in the manner described, and whereby the one valve is made to govern the ingress and egress of the gas to or from the reservoirs, as well as to control the inlet and exhaust of the working cylinder.

183. CORN PLANTERS; James Hughes and Nathan Stoneleiper, Cambridge, Maryland.

Claim—The detached arrangements of the gravitating trigger, connecting rods, perforated slide, hoppers, and scorer, operating as described, to deposit seed at each pressure and relaxation of the thumb of the driver.

184. HEATING APPARATUS; Rensselaer D. Granger, Philadelphia, Pennsylvania; ante-dated Nov. 24, 1858.

Claim—Combining the air chamber with the separate perforated chamber, having an independent communication with the air, so that the said perforated chamber may serve the double purposes of consuming the gases arising from the ignited fuel, and of preventing the rapid destruction of the bottom of the chamber by the action of the fire.

185. COAL STOVES; R. D. Granger, Philadelphia, Pennsylvania; ante-dated Nov. 24, 1858.

Claim—Hanging within the stove and immediately above the fire, a perforated chamber, when so constructed and arranged that the air shall have free access to the interior of said chamber, and when the latter shall admit of being readily raised and lowered, or its position in regard to the fire otherwise altered.

186. FISH TRAP; Robert Gray, Anson, Maine.

Claim—The strainer, the vibrating slats, and the V-shaped chambers, in the manner specified.

187. FASTENING FOR BREASTPINS, &c.; Benjamin F. Grinnell, City of New York.

Claim—The permanent hook and spring, in combination with the hinged pin of a breastpin, or other article of jewelry, when the spring is so bent as to direct the pin, when the latter is depressed, into the hollow of the hook, and when the spring and hook are otherwise arranged in respect to each other.

188. HOUSE VENTILATION; John H. Griscom, City of New York.

Claim—The employment of an auxiliary flue or tube, connecting the hot air flue with the ventilating flue, in the manner proposed.

189. COTTON CULTIVATORS; John M. Hall, Warrentown, Georgia.

Claim—In combination with the series of adjustable revolving hoes, the scrapers, in advance of them, substantially as described.

190. APPARATUS FOR EVAPORATING SACCHARINE JUICES; Lyman P. Harris, Mansfield, Ohio.

Claim—1st, The stationary yet portable fire-place, with the stops and the springs. 2d, The portable, movable, and inclined furnace, and its combination with the stationary fire-place. 3d, The handles and their springs, and their combination with the springs; also, the rod, or its equivalent. 4th, The racks and their combination; also, the movable flue or plate and its rod, and their combination with the movable furnace and stationary fire-place. 5th, I do not claim the heater, nor evaporator, as my invention—but I claim, as an improvement, the application of one or more strainers and valves to the heater and evaporator.

191. COFFEE ROASTERS; Theodore Heerman, Mitchelsville, Tennessee.

Claim—1st, The specified arrangement of the plates or shelves, for the purposes set forth. 2d, The combination of a window or windows in one or both ends of a coffee-roaster, with the inclined elevating plates or shelves.

192. CORN PLANTERS; John L. Hoag, Geneva, Illinois.

Claim—The arrangement and combination of the arm, lever, K, and bar, said lever serving as an oblique brace to hold the bar. Also, the arrangement and combination of the lever, slide, lever (j), upright, bar, and swinging frames, as described.

193. REVOLVING HARROWS; Mark W. House, Cleveland, Ohio.

Claim—The combination with the spindle of a revolving harrow, of the cap and box, for the purpose described.

194. CATTLE PUMPS; John H. Irwin, Carlenville, Illinois.

Claim—The platforms, weight, drum, and pulley, placed loosely on drum, and connecting with it by the pawl and ratchet, the whole being combined as set forth.

195. COMPOSITION FOR LINING METAL PIPES; Wm. Johnson and Hugh Forbes, Brooklyn, New York.

Claim—The composition of matter, substantially as set forth, for lining metallic, or other pipes or surfaces of a similar kind.

196. HARVESTERS; Wm. F. Ketchum, Buffalo, New York.

Claim—The combination of the openings in the guard-tooth below the cutters with the caps above the cutters, as described.

197. ROLLING AND PRESSING WOOL; Wm. W. Purdy, Liverpool, Ohio.

Claim—The combination of the sectional rollers with the strap and breast-piece, for the purpose of rolling and pressing fleeces of wool, as described.

198. Truss Springs; J. W. Riggs, City of New York.

Claim—Constructing springs for trusses, in the manner set forth.

199. Method of Packing Cartridges; E. K. Root, Hartford, Connecticut.

Claim—Putting up cartridges between two blocks, or their equivalents, as described. Also, forming in the package or holder a receptacle or receptacles for containing caps or other primings, as described.

200. Seeding Machines; John F. Seaman, Clyde, New York.

Claim—Operating the seed-distributing device by means of the part of the handle attached by a pivot to the other part of said handle, and connected at its lower end to the shaft by a cord or chain, the above parts being used in connexion with the spring attached directly to the other handle of the implement, and to the shaft, by a cord or chain, the whole being arranged as set forth.

201. Horse-shoe Machine; Solomon Shetter, Allegheny, Pennsylvania.

Claim—1st, The curved arms of clamps, moved and operated by the friction rollers, and the backward and forward movements of the table, when the clamps are used in connexion with the dies, as described. 2d, The use of the flexible strip, for the purpose of operating the clearer, as described 3d, The arrangement on the upper surface of table, of dies, springs, the under jaw of the shears, and the clearer, when used and operated in connexion with the clamps, friction rollers, roll, shear, and swage, as described.

202. Sweeping Machine; Stephen Wm. Smith, Brooklyn, New York.

Claim—1st, The combination of the gears with the driving-wheel, constructed as described. 2d, The method of adjusting the brush by the plate, which admits of both vertical and lateral adjustment. 3d, Preventing the escape and rising of the dust by means of the flexible curtain.

203. Manufacture of White Lead; Benjamin F. Smith, City of New York.

Claim—The manner of filling the chamber with metallic lead, by means of the open work tables or racks in which the lead in detached pieces rests, arranged one above the other in successive and close series, and whereby a more thorough and equal circulation of the fumes or gases amongst the lead is produced. Also, constructing the converting chamber with an inclined bottom. Also, the method described of extracting from the converting chamber the carbonate of lead, and other incidental products, by means of a current or currents of water passing through said chamber from top and bottom. Also, subjecting the carbonate of lead, and other incidental products, previous to their extraction from the converting chamber, to the action of steam, substantially in the manner specified.

204. Instrument for Turning the Leaves of Music Books, &c.; C. B. Thayer, Boston, Assignor to self and Charles Robinson, Cambridgeport, Massachusetts.

Claim—The double holding cords, elastic springing cords, or their equivalents, back or catch band, provided with clamps, and notch, and the curved eccentric rod or way, operating in connexion with, and in relation to, each other, in the manner specified. Also, the escapement catch, operating in connexion with the curved rod and thimbles of the holding cords, as described.

205. Horse Power; Ferdinand M. Sofge, Columbus, Georgia.

Claim—The combination of the cogged wheel, having the supporting flanch and the wheel, with corresponding cogs and bearing, revolving upon the supporting ring.

206. Cooking Stoves; P. P. Stewart, Troy, New York.

Claim—In combination with a stove, such as described, making the front plate of the oven open with doors, and an apron to receive and hold a tin kitchen or roaster, that the heat radiated by the front plate of the fire chamber may be aided by the heat radiated by all the oven plates when combined with an end door, whereby the draft may be controlled without the aid and independent of the front doors. Also, the boiler having a removable cover and two inclined flues, which are separate at the lower end, united into one at top to connect with the chimney, in arrangement with the exit flue space, to which the boiler is fitted, and into which the gaseous products of combustion are discharged from the series of direct and return flues, substantially as specified.

207. Devices for Gathering Grain into Gavels; W. M. Waggoner, Middletown, Indiana.

Claim—The stationary fingers and the fly or gathering fingers attached to a suitable framing or stanchions, mounted on wheels, as set forth.

208. Devices for Reefing Sails; Louis B. Wakeman, Baltimore, Maryland.

Claim—The employment of the smooth-surfaced clamp, as described, when in combination with the forked screw-bolt, or its equivalent, carrying the blocks through which the rolling halyards pass, for the purposes set forth. Also, giving direction to windlass ropes by the bent arm, when in combination with the clamp and forked screw-bolt, when fitted with an ordinary block, operating in the manner set forth.

209. Harvesters; Wm. M. and Andrew Whitely Springfield, Ohio.

Claim—A finger so constructed that the slot or opening above the cutters shall increase in capacity from front to rear, in combination with the clearing projection described, passing directly into the rear corner of said opening, in the manner described. Also, forming the clearing projections of a bent extension of the cutter, as described.

210. Railroad Chairs; John Young, West Galway, New York.

Claim—The combination of bearing surfaces capable of forming any desired angle with each other, and the securing portion of the chair, substantially as set forth.

211. Grain-Fan and Corn Sheller; Hamilton E. Smith, Philadelphia, Pennsylvania, Assignor to self, D. B. Nelson, Cortland Co., and John L. Myers, Chemung Co, New York.

Claim—Arranging the spiked roller and slotted shield of a corn sheller on the frame of a grain-fan, in respect to, and in combination with, the sieve frame, blower, and inclined plane of the said grain-fan, in the manner described, so that the said blower, sieve frame, and inclined plane, may serve the purpose of separating the cobs from the shelled kernels of corn, and the latter from the chaff, and other refuse.

212. Manufacture of Steel; Frantz Anton Lohage, Unna, Prussia, Assignor to Edmund Leopold Bewzon, Boston, Massachusetts; patented in England, January 29, 1850.

Claim—Regulating the heat and stopping the decarbonization of the fused mass of metal in the finishing process in the puddling or reverberatory furnace, before it becomes converted into malleable or wrought iron, and whereby I obtain steel in the manner specified.

213. Paddle Wheel; Nelson Orcutt, Assignor to self and G. W. Gregory, Binghampton, New York.

Claim—The centrally suspended paddle or bucket without any stop, means, difference of area or of weight,

for holding it in a working position, but left entirely to the action of the forces exerted upon it during the revolution of the wheel, as set forth.

214. UMBRELLA FRAMES; Joseph Bloom, Assignor to R. E. Rogers, Philadelphia, Pennsylvania.

Claim—The bow or rib, constructed substantially as described. I am aware that the bow or rib, and the brace or sustaining rod, have been attached to collars upon the standard by a piece of metal having an enlarged end affixed to the end of the bow or rib, and a like piece of metal affixed to the end of the brace; the enlarged end fitting into a slit of a sheet metal collar, the flanch of which must be swaged down upon the enlarged end, in order to hold it in place; and I therefore do not claim this method—but I claim connecting the bow or rib and the brace or sustaining rod to the collars upon the stem or standards, by the means set forth. I am also aware that the end of the brace or sustaining rod has been connected to the bow or rib, by the end of the brace being riveted to a band, which may be sprung into a groove in the inner surface of the bow or rib, and I therefore do not claim this method of connecting the two parts here named—but I claim connecting the brace or sustaining rod to the bow or rib by the spring board embracing the bow, as set forth.

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215. TREATMENT OF FATTY ACIDS; J. C. Appenzeller, Cincinnati, Ohio.

Claim—After subjecting the mixture for a time to the direct action of steam, shutting off the steam from it, and raising its temperature by the application of heat to the exterior of the vessel.

216. VALVES FOR STEAM ENGINES; Robert Bailey, Troy, New York.

Claim—The arrangement and combination of the tubular valve, seat, induction pipe, eduction valve, levers, and cams, as described.

[The puppet valves of a steam engine are, in this invention, constructed with hollow tubular stems fitting with stuffing boxes directly to the induction and eduction pipes of the engine, and making communication directly through their interiors and around the exteriors of their seats between the pipes and the cylinder, thus very simply making them balanced valves.]

217. CAR SEATS AND COUCHES; W. M. Baker, Walpole, Indiana.

Claim—1st, The arrangement and combination of the boards, arms, curved bar, legs, fenders, slide, seat, and rods, as described. 2d, The arrangement and combination of the curtain, H, the seat backs, drums, weights, curtains, U, and rod, so that when the rod descends, the curtains, U, will fall, and the curtain, H, rise, and when the rod is released, all the curtains will be simultaneously rolled up.

218. BRICK MACHINE; Gerard Bancker, City of New York.

Claim—1st, The combination of the adjustable plunger with the side rods and rods of the rotating mould box, for operating the compressors, in the manner described. 2d, The use of the cleat, in combination with the rotating moulding box and semicircular stationary cap plate, as described. 3d, The use of an elevator plunger, operating in combination with the rectangular rotating mould box, adjustable compressors, and cap plate, as a device for moulding and compressing clay into bricks, and discharging the same therefrom.

219. APPARATUS FOR DISPLAYING STEREOSCOPIC PICTURES; Joseph Beckel, City of New York.

Claim—1st, In combination with an endless chain of pictures, the revolving prism, arranged and operating as described. 2d, The rest or stop. 3d, The concave. 4th, The pads or cushions, arranged and operating as specified.

220. WIND WHEELS; W. H. Benson, Wetumpka, Alabama.

Claim—Constructing a wind wheel of a series of strips or slats placed centrally on a shaft, spread, and overlapped, and secured together and to the shaft, as described.

221. SODA WATER APPARATUS; Edmund Bigelow, Springfield, Massachusetts.

Claim—The arrangement of a set of syrup cans, ice chamber, and draft pipe. Also, the combination of a measuring faucet with the described arrangement of devices for drawing the syrups and soda water.

222. MACHINERY FOR FORMING HAT BODIES; Seth Boyden, Newark, New Jersey.

Claim—Conveying the fur from the picker to the perforated cone, by means of jets of steam issuing from the tubes, arranged relatively with the picker and cone, as described.

223. LOUNGE; John G. Broemser, St. Louis, Missouri.

Claim—The described arrangement of the spring catch and the serrated arc, in combination with the pawl which gears into ratchet teeth at the lower edge of the hinges, and which is attached to a rocking cross-bar, and connected to the catch. Also, the valve in the seat which is operated by an arbor, and by means of a cam and a hook, in combination with the sliding frame.

224. BOOT-JACK; Wm. W. Cansler, Baltimore, Maryland.

Claim—The metal folding boot-jack, described, with pointed prongs and pointed end.

225. MOLE PLOUGH; Jarvis Case, Bloomington, Illinois.

Claim—1st, So suspending the mole to the beam or coulter as that it cannot go vertically beyond a given depth, whilst it may move laterally. 2d, Extending the nose of the mole into the rear of the coulter, so that it cannot at any time run out of the line of cut of said coulter at its point.

226. FIELD FENCE; Seth Cheney, Riantone, New York.

Claim—The particular construction of panels, and its combination with the rails, in the manner set forth.

227. LAMPS; Samuel Cheney, Cleveland, Ohio.

Claim—The gas tube and openings, in combination with the wick tube and cap, when constructed as described.

228. AMALGAMATOR; Augustus M. Church, Augusta, Georgia.

Claim—The arrangement described of the vibrating riffles of the inclined trough, by which it is proposed to save the finest particles of the gold by amalgamation.

229. METHOD OF HANGING RECIPROCATING SAWS; John C. Cline, Philadelphia, Pennsylvania.

Claim—The employment of a spring either straight or spiral to suspend the fulcrum of pitman bars, or other reciprocating levers, in the manner set forth.

230. PORTABLE BEDSTEAD; Francis Cotton, Brooklyn, New York.

Claim—The arrangement of the stand rails, straps, and end supports, forming an improved portable bedstead.

231. PAPER RAG ENGINES; Isaac N. Crehore, Boston, and Francis Stiles, Jr., Leicester, Massachusetts.

Claim—A bed-plate composed of sheet metal knives, corrugated or formed with a series of angles or curved lines through their entire length, in the manner described.

232. RAILROAD CHAIRS; D. W. Crocker, Deposit, New York.

Claim—The arrangement and combination of the inclined grooves, key, jaws, and rail, so that the weight of the cars will depress the base parts of the chair, and thereby cause the jaw parts to gripe the rail more firmly.

233. FIELD FENCE; Daniel S. Curtiss, Madison, Wisconsin.

Claim—The mode of notching the ends of the rails, and keying together the ends of the panels, in the manner set forth.

234. CORN HUSKERS; Abbot R. Davis, East Cambridge, Massachusetts.

Claim—The combination of the rolls, spring board, slotted projection, and conical projection, when constructed in the manner described.

235. SUGAR CANE MILLS; Wm. T. Dennis, Richmond, Indiana.

Claim—The plating or covering of the iron roller of sugar cane mills with tin, or other anti-corrosive metal or substance.

236. CONSTRUCTION OF POSTS FOR FIELD FENCES; John Drown, Huron, New York.

Claim—The arrangement of the braces, one fixed and the other hinged or pivoted thereto, in combination with the rails and chair, as specified.

237. HYDRAULIC PRESS; Richard Dudgeon, City of New York.

Claim—The described hydraulic press consisting of the injection piston, chambers, and ram, constructed as set forth.

238. SHOE HORNS; Daniel E. Eaton, Boston, Massachusetts.

Claim—The improved shoe horn, as made with a heel guide and nipper jaw applied to two crossed levers and so as to operate together as specified.

239. IRON BRIDGES; Lewis Eikenberry, Easton, Pennsylvania.

Claim—1st, Having the uprights and diagonals of the side formings of the bridge so united together that they shall be capable of turning on their points of connexion, and thus, whenever expansion or contraction in the metal occurs, they may be able to compensate therefor without ceasing to brace the bridge at top and bottom. 2d, The combination of lattice side frames of bridges, formed of diagonal braces and angle iron uprights, which are united together, so as to turn on their points of connexion with tubular, semi-tubular, or angle iron arches, as set forth.

240. COFFEE POTS; W. H. Elliot, Plattsburgh, New York.

Claim—1st, The combination of boiler, stillworm condenser, conducting or discharge tube, the external opening of the stillworm at g, when these devices are so arranged in relation to each other that an opening to the external air shall be provided for the non-condensible gases, while the condensible vapors are reduced to a liquid without coming in contact with the condenser water, and then turned by conductors into the boiler. 2d, The arrangement of the joint below the spout, so that no vapor can pass through the spout without first passing the joint. 3d, The employment of conductors in combination with the condenser, for the purpose of filling the water-joint or keeping it full.

241. TANNING; Lewis C. England, Owego, New York.

Claim—1st, Applying the liquor to the bark while said bark is being discharged from the mill, for the two-fold purpose of making it a conveyor of the same, and a preserver of the dust thereof. 2d, The method of applying the heated liquor to the bark, for the purposes and in the manner set forth.

242. THRESHING MACHINES; John B. Ford, Addison Sullivan, and Albert Gregg, New Albany, Indiana.

Claim—The combination of the cutting cylinders, A A, provided with knives, the cylinder, C, and concave, B, provided with teeth, screens, and the fan, in the manner specified.

243. SEWING MACHINES; Wm. A. Fosket and Elliot Savage, Meriden, Connecticut.

Claim—The feeding device, so operating as to cause the cloth to progress by grasping the same with a positive force, in contradistinction to the employment of spring pressure between two surfaces moving in unison while feeding. Also, setting the shank of the revolving and reciprocating looping hook at an angle to the bed-plate, for the purpose of avoiding motion of the said hook in the direction of the axis of revolution. Also, operating the slide plate from above the sewing table by means of a feed-foot having two motions, one vibratory in the line of feed, the other reciprocatory and perpendicular to the table, or thereabouts.

244. SMUT MILLS; Carl Frank, Cleveland, Ohio.

Claim—Arranging between the trough containing the grain to be scoured and the scouring cylinder, a slotted hollow cylinder, revolving within another hollow cylinder.

245. HORSE POWERS; John Frezer, Newberry, Pennsylvania.

Claim—The combination of the flanch upon the end of the sweep shaft, with the groove in the collar, or its equivalent, for securing the shaft against the longitudinal motion, in connexion with the wheel and pinion attached to the sweep shaft, and the stationary wheel and pinion which keep the shaft in a directly radial position.

246. COMBINED CHAIR AND LOUNGE; F. J. Gardner, Washington, North Carolina.

Claim—The seat, back, and supplemental back, connected together by joints, and provided respectively with the legs, arms, and rockers, as set forth.

247. LANTERNS; Conrad Gersten, Brooklyn, New York.

Claim—The mode of controlling the currents of air which feed the flame, by taking the air from the top of the lantern and causing it to pass down in a narrow annular passage to the apertures leading to the burner, in combination with the deflector which encloses the burner chamber. Also, in combination with a lantern in which the flame is protected against disturbing causes outside, the arrangement for controlling the wick

from outside the lantern. Also, combining with the burner and the oil reservoir, and interposed between the two, an air chamber for preventing the oil from being overheated, as described.

248. Boring Machine; E. A. Goodes, Philadelphia, Pennsylvania.

Claim—1st, The adjustable worm attached to its shaft, and arranged as set forth. 2d, The gauge plate attached to the bow, in connexion with the index on the mandrel, for the purpose specified. 3d, The arrangement of the tube on the shaft, pinion, I′, on said shaft, the pulley on the the tube, and also the pinion, i, and the rack on the mandrel, as set forth.

249. Hemp Brakes; John Hindman, Haynesville, Missouri.

Claim—The reciprocating beater, stationary bar, and reel, combined and arranged as set forth.

250. Screw Propeller; Augustus Jouan, San Francisco, California.

Claim—Combining with the rigid blades of a propeller, an elastic blade, as described.

251. Machine for Sawing Winding Forms; John C. Hitz, Cincinnati, Ohio.

Claim—1st, In combination with one or more shifting supports or rests, the rocking bench, suspended at or near its windwith by journals, and provided with suitable feeding and canting mechanism. 2d, In connexion with a carriage and crane, and with a rocking bench, having the described or equivalent feeding or canting mechanism, the vibratory and arched rest, armed with spikes. 3d, In combination with a rocking rest and spheroidal feed roller, the pointer, adjustable in height and having automatic retrograde motion, so as to indicate on the top of the slab the relative position of the bottom of the kerf. 4th, In combination with the rocking bench, the prying lever, constructed as set forth.

252. Method of Extracting Oil from Coal; E. N. Horner, New Brighton, Pennsylvania.

Claim—The use of a mixture of cream of tarter, common salt, and slaked lime, for the purpose of condensing the oleaginous vapor produced by the dry distillation of coal, shale, or other bituminous minerals, extracting the oil from the gas and depriving the gas of its inflammable quality, and throwing off the sulphurous vapor, in the manner specified.

253. Washing Machine; Benjamin Illingsworth, Freeport, Illinois.

Claim—A washing machine, having a tilting box, cylinder, spring rollers, and otherwise constructed as described.

254. Lamps; Richard Jenkins, Covington, Kentucky.

Claim—The combination of the inner and outer cones, when arranged in relation to the wick tube and each other, as specified, and supplied with air or oxygen, for the purpose of maintaining a perfect combustion of the heavier gases or matter arising, by capillary attraction, in the space or chamber existing between the cones, and thus producing, with coal oil, a brilliant flame, with very little, if any, blue appearance at its base above the outer cone.

255. Machines for Making Clay Pipes; John Jones, Baltimore, Maryland.

Claim—A two-sized permanent core or mandrel, in combination with the fixed die and adjustable jaws, constructed in the manner described.

256. Apparatus for Evaporating Sugar Juice; Augustus Jouan, San Francisco, California.

Claim—The floating cover applied to the evaporation of saccharine liquids, or for concentrating heat for other purposes, constructed as set forth.

257. Method of Blowing-off Steam Boilers; James H. Washington, Baltimore, Maryland.

Claim—Connecting the pipe, c, by an elastic or yielding joint to the stationary pipe, and furnishing its opposite end with a float that will keep the inlet into said pipe, c, at or a little below the surface of the water in the boiler, so as to blow off sediment, &c., at the surface, however much it may rise or fall, or vary.

258. Furnaces for Distilling Zinc; Samuel Wetherill, Bethlehem, Pennsylvania.

Claim—The employment of vertical retorts with movable caps at top and movable cups at bottom, in combination with the fire chamber of a furnace, and suitable chambers for the circulation of heat, when applied to the reduction of ores of zinc to the metallic state. Also, in combination with retorts for the reduction of the ores of zinc to the metallic state, the mode of mounting the vertical retorts, by having them sustained by their lower ends resting in suitable sockets, and unconfined at their upper ends, whereby they are free to yield to unequal expansion. Also, in combination with retorts for the reduction of the ores of zinc to the metallic state, the employment of two fires with separated ash-pits, whereby the fires can be separately cleansed and stocked, to admit of applying a continuous heat to the retorts. Also, in combination with vertical retorts for the reduction of the ores of zinc to the metallic state, the employment of perforated central tubes, for the discharge of the metallic vapors from the charge, and the condensation thereof to the metallic state. Also, the combination of the vertical retorts, the perforated central tubes, and the movable cups and appendages at the bottom, and the movable caps at the top, all concurring in the more ready changing of the retorts, the working of the charge, the escape and condensation of the metallic vapor to the metallic state, and the delivery thereof, and the discharge of the residuum from the retorts, and the re-charging of them.

259. Boat for Transporting Railroad Cars; Jesse Wheelock, Lancaster, New York.

Claim—1st, The arrangement of the ropes or chains, pulleys, and timbers, when applied to each end of the boat, for the purpose of holding the boat steady at the bow and stern while the cars are being transferred to or from the boat. 2d, The arrangement of the bumper dock relatively to the dock and slip, for the purpose of arresting the headway of the boat, and allowing it to be drawn sidewise into the slip, so that the track which runs lengthwise of the boat may be brought into line with the suspended track. 3d, The combination of the suspended track with or without the short portion, with the track on the boat, for the purpose of conveniently transferring the cars to or from the boat, at whatever height the boat may stand in the water.

260. Heating Apparatus; George W. Williamson, Scranton, Pennsylvania.

Claim—The application to fire chambers or smoke flues of a double series of plates, when the same are constructed in the manner set forth.

261. Rotary Pump; George Wingate, Philadelphia, Pennsylvania.

Claim—The revolving bucket wheel with any suitable number of pistons, operated by the cam, in combination with the exterior casing, its chambers, and partitions.

262. Washing Machine; George W. Wilson and Andrew Johnson, Walnut Grove, Illinois.

Claim—A washing machine, having upon the central cylinder a plate, arms, curved slats, and rod, for securing the clothes, and in the upper part of the cover a rubbing device consisting of a slat, with slats or corrugations at its sides and rollers.

263. Valve Gear of Oscillating Steam Engines; Herman Winter, City of New York.

Claim—1st, The method of causing a shaft by means of which the valves of an engine are moved to revolve through the agency of a cam, a lever, and a crank, and the oscillation of the cylinder to which the shaft is attached. 2d, The combination of a toe keyed to some rod which actuates a valve or valves, with an adjustable swinging toe and a revolving cam, as set forth.

264. Washing Machine; George L. Witsil, Wilmington, Delaware.

Claim—The combination of the corrugated or fluted conical cylinder, placed vertically with the corrugated or fluted sides of the conical tube, as described.

265. Process for Decomposing Fats; Robert A. Wright and Louis J. Fouche, Paris, France.

Claim—Producing a continuous automatic circulation of highly heated water in a very finely described state through the bodies under treatment, by means of an apparatus constructed as described.

266. Boot-jack; Wm. D. Young, Baltimore, Maryland.

Claim—The construction of a boot-jack, when used in combination with a chair, as described.

267. Clothes Frame; Daniel C. Colby, Keene, Assignor to self and Daniel W. Ransom, Croydon, N. H.

Claim—The arrangement of the levers, in combination with the pawl and the shaft, operating as set forth.

268. Drawing Frames for Fibrous Materials; Silas C. Durgin, Holyoke, Massachusetts, Assignor to self and Ammon R. Durgin, Nashua, New Hampshire.

Claim—The arrangement of the conical draft rollers between the gauge trumpet and the other reducing rollers, and supporting such trumpet by a mechanism, which will enable the said trumpet to operate both as a gauge to the sliver and to guide it to the rollers, and to be vibrated with regard to the conical rollers. Also, the combination of mechanism for supporting and vibrating the trumpet, the same consisting of the bent lever, the overbalance carrying lever, and the stationary stud. Also, the arrangement of the supporting arm, of the weight above the fulcrum of the lever, to operate with reference to the lateral drag of the sliver on the trumpet, as described.

269. Knitting Machines; Jonathan Filler and Joseph Bullock, Cohoes, Assignors to Wm. Smith, Albany, New York.

Claim—The apparatus attached to the stop carriage, viz: the combination of the slides, parol, gauge, and arm, operating together upon the breaking of the fabric to uncouple the driving powers by and in combination with the ring, pin, and spring, which release the detent.

270. Telegraphic Machines; David E. Hughes, Assignor to the American Telegraph Company, City of New York.

Claim—1st, Giving to the key, while still pressed by the operator, a second motion at the instant that the circuit is closed or broken, as the case may be, so that an indication of said closing or breaking will be given to the operator. 2d, The method for governing the position of the letters upon the type-wheel with respect to that of the platen or roller over which the paper travels, in order to insure an exact position of any particular letter at the moment of printing the same, viz: by so advancing or retarding the said type-wheel upon its shaft, whenever it has lost or gained in time in regard to the travel of the circuit breaker at the distant station, that the letter indicated will be certain to stand directly over the said platen at the movement the latter brings the platen into contact with said letters. 3d, Effecting the printing of each letter without arresting the motion of the type-wheel, by causing the platen to revolve in the same direction and with the same speed as the type-wheel, while said platen is bringing up and holding the paper in contact, whereby the paper is advanced along with the type or letter from which it is receiving an impression. 4th, The devices by which the type-wheel is started from its zero by an operator at a distant station, consisting of the shaft, set in motion by the electric current, and acting in combination with the clutch lever and the wheel, whereby the type-wheel will be advanced up to the time that it becomes engaged with its driving shaft.

271. Electro-bathing Apparatus; Wm. W. Karshner, Cincinnati, Ohio.

Claim—1st, The suspending non-conductor bands and the conducting foot-plate, insulated from the bath tub by the non-conducting substance. 2d, The combined use of the above described non-conducting bands, the conducting foot-piece, and the non-conducting substance, or their equivalents, for the purpose of administering an electric bath for therapeutic purposes.

272. Revivification of Bone Black; Henry Kattenhorn, City of New York.

Claim—The method of washing bone black or animal charcoal in the purifying of sugar, as described.

273. Knitting Machines; Chauncey G. Keeny, Manchester, Connecticut.

Claim—The employment of a card attachment to knitting machines, in the manner described.

274. Marine Steam Engines; Wm. Kennish, Jr., City of New York.

Claim—The application of an auxiliary pipe to the present discharge pipe of a marine steam engine, in the manner described.

275. Machine for Cutting and Setting Saw Teeth; Columbia G. Loynes, Lenox, Massachusetts.

Claim—The devices for punching and shearing metals, arranged in connexion with the saw-gummer and saw-set, in the manner set forth.

276. Machinery for Scutching Flax; Wm. C. McBride, Raritan, New Jersey; patented in England, May 20, 1856.

Claim—The mode of operation of the combined rotating blades or beaters, with the interposed stocks. Also, combining two scutching machines, by means of the two feeding wheels, with their bands for transferring the fibres which have been scutched at one end, that the other may be properly presented to the second scutcher. Also, in combination with the two sets of feeding bands and wheels, the sustaining and guiding table, by which the upper unscutched ends of the fibre are held up, guided, and properly presented to the second scutcher, as set forth.

277. Manufacture of Candles; Antonio Meucci, Assignor to D. B. Loraine, Clifton, New York.

Claim—The method of forming mould candles in saturated porous candle moulds, in contradistinction to the method in general use of forming them in candle moulds of impervious metals.

278. Heating Apparatus; U. D. Mihills, Hartford, Wisconsin.

Claim—A heat controlling cylinder, in which the regulating disks, shaped as described, are connected with a detachable frame.

279. Washing Machine; Wm. H. Milhouse, Sugartown, Pennsylvania.

Claim—1st, Securing strips of india rubber edgewise in slots in the concave and rubber, by means of the slots which are bolted in between the successive strips. 2d, The arrangement of the adjustable frame, levers, swinging rubber, pitman, and shaft, with the concave, constructed in the manner set forth.

280. Bed Bottom; B F. S. Monroe, Utica, New York.

Claim—The two frames with the spring secured between them, the frames being connected by the cross bands covered or enclosed by any suitable fabric, and the upper frame supporting the seat or mattress, as set forth.

281. Pumps; Walter Peck, Rockford, Illinois.

Claim—The combined arrangement of the stationary standard, vibrating lever, and lifting spring, with the plunger, as specified. Also, the combined arrangement of the hollow plunger having a cylinder and spout, and attached directly to the handle, with the stationary chamber and steadying springs, as specified.

282. Combined Punch and Awl; F. P. Pfleghar, Whitneyville, Connecticut.

Claim—The rotating hollow head provided with a series of cutter tubes of different sizes, in combination with the awl attached to, or forming a part of, the bent bar or rod, which, as well as the head, is attached to the jaw, and provided with a spring plate or stop.

283. Twisting Fibrous Substances; George W. Pittman, Bushwick, New York.

Claim—The application of the flyer, or its equivalent, in combination with the rollers and spool, or other equivalent means of holding the sliver, and taking up the twist produced by the flyer, whereby the same operation is made to spin the sliver into yarn, and twist the same with one or more other yarns, simultaneously.

284. Razor Strops; Michael Posz, Shelbyville, Indiana.

Claim—The self-lubricating razor strop, when constructed in the manner described.

285. Belt Trusses; H. H. Reynolds, Buffalo, New York.

Claim—The combination of the T-spring with the conical spring, pad, belt, and perineal strap.

286. Stoves; Philip Shreiner, Columbia, Pennsylvania.

Claim—The air-supplying tubes and air-heating cylinders, when combined with a stove, the heat of which is unobstructed by outside casings.

287. Photographic Plate Vices; M. M. Rison, Paris, Tennessee.

Claim—A photographic vice having its eccentric lever provided with a groove, a clamping jaw provided with a catch, to engage a jaw provided with a spring pawl, which engages a rack, and otherwise constructed as described.

288. Wagon Brake; Daniel Robinson, Lenox, Pennsylvania.

Claim—The combination and arrangement of the sliding frame, curved bars, attached to the rock shafts, and passing through the traverse bars of the frame, and the shoes, attached to the ends of the rock shafts, the several parts being fitted in the truck or bed, as set forth.

289. Machine for Splitting Wood; P. P. Ruger, City of New York.

Claim—The spring or yielding guide for relieving the cross-bars, in the manner specified. Also, the guide plate with the uprights, arranged in combination with the wood splitters, as specified.

290. Ball Furniture Casters; B. A. Russell, Deep River, Connecticut.

Claim—A furniture caster, when composed of cylinder or casing either with or without the radial set-screws or ribs, in combination with the plate and ball, constructed in the manner set forth.

291. Breech-loading Fire Arms; Christian Sharps, Philadelphia, Pennsylvania.

Claim—1st, Forming on the outer end of the sliding bush as the sole bearing point against the breech, an annular inclined projection with a sharp annular edge coinciding with the smallest portion of the bore of the said bush. 2d, The annular termination of the sliding bush fitting into an annular recess formed in the barrel, and over-lapped by the sharp-edged annular projection, as set forth. 3d, The convex base as fitted into a concave socket in the breech, so as to form a self-adjusting base for the end of the barrel.

292. Breech-loading Repeating Fire Arms; Christian Sharps, Philadelphia, Pennsylvania.

Claim—1st, Exploding in succession a number of cartridges of the class described, by means of a projection caused to revolve by the movements of the hammer, when the said cartridges are so arranged, in respect to the said projection, that the latter shall strike the edge only of each cartridge in succession. 2d, The catches, so arranged on the stock in respect to the bores of the barrel block, that on moving the latter from the breech, they may be the means of withdrawing the whole of the cartridge simultaneously from their respective bores, as set forth.

293. Boot Heels; Stillman Thorp, Portland, and Wesley Thorp, Turner, Maine.

Claim—The combination of the metallic plate spring or shank stiffener, and the rotary heel-piece, connected together and applied to the heel and shank of a boot or shoe, as specified.

294. Washing Machine; Wm. B. Twiford, Chincoteague, Virginia.

Claim—The opposing incline planes on the underside of the ends of the sliding roller frame, in combination with fixed concave projections or ledges on the sides of the tub or box, and with grooves of greater width than the diameter of the journals of the roller, in the sides of the box.

295. Lamps; Hezekiah Knowles, New London, Connecticut, Assignor to Fellows, Hoffman & Co., City of New York.

Claim—The lower or diaphragm reflector surrounding the wick tube at or near its upper edge, in combination with the upper deflector and the chimney, having suitable openings for the supply of a draft of air to the inside, and to feed the flame outside of the upper deflector.

296. Harvesters; Geo. W. Richardson and Robert Glover, Grayville, Assignors to selves, J. B. Williams, and Wm. A. Horrall, White Co., Illinois.

Claim—1st, The jointed spring arm, in combination with the spring catch, operating so as to catch and hold the arm when it has gathered the grain, and retain it in this position until the bundle is ready to be deposited free from the platform. 2d, The raker, in combination with the rod, crank, rest, and retracting weight, arranged to produce the reciprocating movements for gathering and delivering the gavel, in the manner described. 3d, In combination with the arm, the connecting rod, and bent lever, operated through the medium of rod, pin, and rest, by the driving-wheel.

Extensions.

1. Coal Stoves; Henry Stanley, Poultney, Vermont; patented January 4, 1845; extended January 4, 1859.

Claim—The manner in which I have combined and arranged the two stories thereof, consisting of two cylinders, with the eight triangular radiating flues, arranged around and in contact with them, said flues communicating with the flue space in the pintle, with the intermediate chamber, and with the corner space: the two latter being divided by partitions into anterior and posterior portions, and there being also openings through the upper end of the upper cylinder into the cornice space: it being distinctly understood that I do not make any claim to either of the individual parts, taken separately and alone, but that I limit my claim to the combination and arrangement thereof as a whole; not intending, however, by this claim, to confine myself, in constructing my stove, to the particular form of the respective parts, but to vary these as I may deem expedient, whilst I attain the same end.

2. Saw Cotton Gin; Eleazer Carver, Bridgewater, Massachusetts; patented January 4, 1845; extended January 4, 1859.

Claim—The combination of a cylinder brush, having fans on the ends thereof, with a cotton gin.

Additional Improvements.

1. Cross-cut Sawing Machine; Albert Heth and Gaylon Hall, Adams Centre, New York; patented August 24, 1858; additional dated January 11, 1859.

Claim—Attaching the bar or beam to the vertical bar by a pivot, and securing the bar or beam and beam, in a proper relative position with each other by means of the rod, loop, and nut, or their equivalents, so that the bar or beam may be more or less inclined according to the thickness of the log, and the bar always retained in a vertical position. Further, in combination with the oscillating platform, lever, and saw-bar, the bar provided with an adjustable weight, and arranged as set forth.

2. Hominy Mortars; John Reezer, Chillicothe, Ohio; patented March 2, 1858; additional dated January 18, 1859.

Claim—The application and combination of the slide with its spring, and roughening of the lower end of the pestle.

Re-Issues.

1. Regulating the Flow of Oil to the Wick in Carcel Lamps; Abraham Coates, City of New York; patented March 25, 1856; re-issued January 4, 1859.

Claim—Regulating the supply of oil to the burner by means of the self-employing drip cup, operating upon the supply valve. Also, placing the fountain or reservoir for the oil above the lens, with its draft opening and its supply pipe, within the barrel or chamber of the lens.

2. Machine for Making Hames; Henry Burt and James Y. Hedden, Newark, New Jersey; patented Feb. 17, 1857; re-issued January 4, 1859.

Claim—The forging of metal into useful forms by the employment of two or more pairs of rolls having their surfaces cut away, and combined, and rotating, and pressing the metal progressively into shape, being conducted from one pair of rolls to another through the agency of the guide.

3. Machinery for Dressing Screw Heads; H. A. Harvey, City of New York, Assignee (through mesne-assignment) of Thomas W. Harvey, late of said New York, patented August 18, 1846; re-issued January 4, 1859.

Claim—1st, The employment of a pair of spring pincers which receive the blanks one at a time, and present them to the jaws point foremost. 2d, In combination with the mandrel and jaws, or equivalent means for receiving and holding the screw blanks, the employment of a punch or driver for inserting the blanks to the required distance. 3d, The combination of the movable rest with the movable cutter head, and for the purpose of giving support to the blank and get out of the way so soon as the cutting operation is completed, and is claimed, whether the cutting operation be perforated on the head, or any other part of the blank. 4th, The particular manner of constructing the adjustable turning head, the slide or seat piece, the tool-holder sliding on the piece, between the check pieces, with the respective adjustments thereof, combined, arranged, and operating so as to effect the setting of the tool; the manner of operating the griping dies, and of separating the blanks in the hopper and conveying them to the feeding fingers, being similar to those described and used in the machine for cutting the threads.

4. Sewing Machines; Anthony W. Goodell, Brooklyn, and Nelson R. Scovell, Albany, New York, Assignees (through mesne-assignment) of Wm. Lyon, Newark, New Jersey; patented December, 1854; re-issued January 4, 1859.

Claim—1st, The combination of a feeding foot pressed on to the cloth and moved to feed the cloth, and then released from said cloth and returned to its former position, with a clamping foot that is raised when the feed of the cloth takes place. 2d, The vibrating bar, feeding foot, arm, and vibrating studs, arranged and acting to communicate motion to the feeding foot. 3d, A looping instrument constructed with a cavity or notch, and an eye carrying the second thread, and receiving a sideway movement after the said looper has passed through the loop of needle threads, for the purpose of carrying the second thread across and beyond the descending path of the needle, when said looper remains in a position for the needle to enter said cavity or notch, as it descends between the looper and second thread, and then said looper receives a sideways movement to its original position to clear the needle in drawing back. 4th, The reciprocating looper formed with the cavity, and with an incline, in combination with a stationary screw, or its equivalent, to communicate the required movement to the looper. 5th, The arrangement of the segmental spring, looper, and arm on the rocking shaft, for the purpose of adjusting and securing, by the screws, the looping point in the desired position with great ease and accuracy.

5. Safety Indicator for Steam Boilers; Lucius J. Knowles, Warren, Massachusetts; patented February 10, 1857; re-issued January 11, 1859.

Claim—1st, A feed apparatus, controlled by expansion and contraction, in combination with an expansion tell-tale, placed below the desired water level and above the level to which it would not be safe for the water in the boiler to descend. 2d, The described arrangement of the vessels, and as applied and connected with the feed pumps and steam whistle, for the purpose of regulating the pump and sounding an alarm. 3d, Connecting the pipe with the boiler, by means of the feed pipe, as set forth.

6. Lamps; Edward F. Jones, Boston, Massachusetts; patented May 4, 1858; re-issued January 11, 1859.

Claim—Securing the chimney to the removable deflector, and both of them to the lamp cap, by means of a spring, operating in the manner set forth. Also, a detached deflector, in combination with a chimney, when the chimney is secured to the cap independently of the deflector.

7. Ventilating Window for Railroad Cars; George Neilson, Boston, Massachusetts; patented May 30, 1854; re-issued January 18, 1859.

Claim—The convergent ventilating window as made, with deflecting and light penetrating sides or surfaces, and an air opening, and a closing window or cover, essentially as explained, and to be applied to the opening of a side of a railway car, substantially as specified. Also, the arrangement of a deflector guard entirely around the window opening and in respect to the deflecting sides, as specified, not intending to claim a deflector or guard as applied to a car window opening, but to claim its arrangements on four deflecting sides or planes, and entirely around the opening between them.

8. Reclining Chairs; Augustus Eliars, Boston, Massachusetts; patented May 11, 1858; re-issued January 25, 1859.

Claim—1st, The general arrangement of devices described for actuating and sustaining both the back and foot-rest, the same consisting of the arms attached to the back in a projection thereof, and having a shaft which travels in grooves, formed in the supporting frame work of the chair and the arms, the whole being combined with the foot-rest and frame. 2d, The combination of the device described, whereby the back can be placed and held in any desired position, and at the same time the proper length of arms retained, the same consisting of the hinged rails, sliding arms, locked upon said rails in any desirable manner, and mortises to receive the said rails, as set forth. 3d, The foot-rest, when combined with a spring or weight, or its equivalent, to operate as set forth, so that the said foot-rest may be raised or lowered at will, to adapt itself to the length of the limb of the occupant. 4th, In combination with a reclining chair, the pecular joint between the back and arms, consisting of the arm attached to the back, and turning upon a pivot in the groove or mortised sliding arm, whereby a very long arm may be obtained.

9. Hulls of Steam Vessels; Ross and Thomas Winans, Baltimore, Maryland; patented October 26, 1858; re-issued January 25, 1859.

Claim—Constructing the hull in the form of a spindle, substantially as described.

Designs.

1. Dining-room Stoves; Conrad Harris and Paul W. Zoiner, Assignors to Harris, Zoiner & Co., Cincinnati, Ohio; dated January 4, 1859.

2. Cooks' Stoves; Conrad Harris and Paul W. Zoiner, Assignors to Harris, Zoiner & Co., Cincinnati, Ohio; dated January 4, 1859.

3. Parlor Stoves; S. W. Gibbs, Albany, Assignor to Evan Backus, Stuveysant, New York; dated January 11, 1859.

4. Ink Bottles; Thaddeus Davis, City of New York; dated January 11, 1859.

5. Cooking Stove; J. K. Hyde, Troy, New York; dated January 18, 1859.

FEBRUARY 1.

1. Apparatus for Raising and Forcing Fluids; Manoah Alden, Philadelphia, Pennsylvania.

Claim—The wheel with any convenient number of buckets formed by the opposite curved vanes, said vanes being placed obliquely to the plane of rotation, and being of a tapering form, so that the buckets may be broader near the centre of the wheel than at the edge of the same, in combination with a wheel race or chamber adapted to the form of the buckets, and with the spiral channel.

2. Burners for Vapor Lamps; Charles F. Allen, Indianapolis, Indiana.

Claim—The combination and arrangement of the tube and lighter, constructed as set forth.

3. Cotton Press; Zachariah Atkinson, Richmond, Georgia.

Claim—The cam rollers, in combination with the levers, as set forth.

4. Gas Couplings; J. B. Atwater, Berlin, Wisconsin.

Claim—The arrangement of the tumbler, rod, connecting piece, lever, which is provided with a foot-piece, pin, rollers, and door or platform.

5. Pumps; Charles F. Bellows, Seneca Falls, New York.

Claim—The arrangement and construction of a pump, as set forth, by means of right-handed and left-handed screws, the threads of one operating within those of the other.

6. Ovens; D. P. Burdon, Brooklyn, New York.

Claim—1st, The arrangement of a series of hinged cars around a disk plate, so that they will deliver bread pans with their contained bread at the proper place of discharge, and also receive the said pans in their revolution; and in combination therewith the circular track, so arranged as to support the ends of said cars upon friction rollers, while at the same time allowing each car to deposit its pan at the proper place, and restore said cars to their proper position to receive the return pans with their bread. 2d, Operating the sliding doors by means of the radial arms, or their equivalents, projecting from the driving shaft, so that the doors will be alternately opened and closed at the proper time for delivering the bread, and receiving the bread to be baked. 3d, Operating the traversing follower by means of radial arms, or their equivalents, for feeding the pans into the oven, when the same is so arranged that the pans will be fed into the cars while the door is open; and in combination therewith, the compensating pulley wheel and weight, for equalizing the motion and returning the traversing follower.

7. Fluxes for Puddling Iron; John Burnish, James Talbot, and Thomas W. Yardley, Pottsville, Penna.

Claim—The silicious sand, loam, alum, clay, lime, oxide of iron, and talcose rocks, when used collectively in, or nearly in, the proportions described, as a flux in the process of puddling iron.

8. Washing Machine; Zjiba Casterline, Liberty, Indiana.

Claim—The employment of balls attached to the rubber of a washing machine, when said rubber has a reciprocating movement in the tub, constructed in the manner set forth.

9. Machine for Polishing Metals; Reuben Cave, Louisville, Kentucky.

Claim—The running of two polishing grit stones edge to edge, in opposite directions, one immediately above the other, and both running at the same time, the upper stone running one-third faster than the under one.

10. Railroad Car Seats; Willis L. Childs, Piermont, New York.

Claim—Attaching to each end of the planes or boards, a curved or segment bar, lapping by each other, so that they will form an arc, having for its centre the point at which the planes or boards are hinged or jointed. Also, suspending a car seat upon the point, in combination with the hinging of the planes or boards, so as to enable it to be reversed without concussion, and also to be used as a reclining seat or sleeping couch.

11. Water Wheel; Wm. Coutie, Troy, New York.

Claim—The stationary plates, arranged so as to prevent a rotary motion in the water when acting on a screw wheel. Also, placing the gate below the surface of the back water, in connexion with the draft tube, for the purpose specified.

12. Stoves; Porter Dodge, Francistown, New Hampshire.

Claim—An improved air-tight stove, the several parts being constructed and arranged in relation to each other, substantially as described.

13. Method of Variegating Wood; Joseph Cowee, Jr., Keene, New Hampshire.

Claim—The emyloyment of rollers, in the manner described, for the purposes of variegating wood.

14. Splice of Bar Rails; Wm. M. C. Cushman, Albany, New York.

Claim—In combination with the flat bar rail, the splice plate or piece, constructed in the manner described.

15. Harvesters; Charles G. Dickinson, Poughkeepsie, New York.

Claim—The combination of the curved arm, curved feet, and braces or compressors. with endless belts or chains, when arranged with relation to each other and to the platform, in the manner described.

16. Envelope Machine; James B. Duff and Thomas W. Keating, City of New York.

Claim—1st, The combination of the pasters, the grooved pressure fingers, and the spring plates. 2d, In combination with a feeding table, having its surface composed of india rubber, or other elastic substance, the use of a plunger operating through a die above the said table, and provided with sharp projecting edges for the purpose, after it has forced the blank through the die, and thus turned back the flaps, of making a sharp crease where the fold is to be made, by pressure between said edges and the elastic surface. 3d, Placing the faces of the lappers in front of their centres of motion, and their axes above the level of the table, so that the plunger, when it descends, shall pass close against the faces of the lappers, and the heels of the lappers, when the latter close, will move outward away from the paper. 4th, Having an open space between the heel of the lappers to receive and hold the edges of the paper, when it is pressed therein by the descent of the plunger.

17. Apparatus to Manufacture Starch; Wright Duryea, Glen Cove, New York.

Claim—1st, The described system of arranging and combining the grinding, washing, and bolting apparatus, to wit: the arrangement of all the stoves side by side, with their respective washers conveniently placed below them, with the arrangement of the bolting cylinders below their respective stones in horizontal series, with one or more interposed endless chain elevators, combining them with the stones next in order of succession in the series, whereby the whole apparatus is brought within two stories of a building, and convenience is afforded for its supervision, and the other advantages set forth are obtained. 2d, The combined arrangement of the lower bolting cylinders and inclined plane or table, with the troughs or gutters, whereby I am enabled to convey away the starch water and the tailings from the said cylinders, by a single conductor for each purpose.

[This invention relates to the process of obtaining the starch water from which the starch is subsequently extracted, by grinding the grain between stones, then washing with water, and passing the ground grain and water through bolting cylinders, re-grinding the tailings from the cylinders, re-washing and re-bolting, repeating the re-grinding of the tailings, and the re-washing and re-bolting of the products, till nothing of the grain remains but the bran. Also, in the employment, in combination with a series of bolting cylinders arranged side by side, of a flat surface of sufficient extent to receive the starch water from the whole series, by which means a freer circulation of air is obtained through and between the cylinders than when separate concave troughs are employed under each one, thereby preventing the so rapid clogging of the bolting cloths, and obviating the necessity of the so frequent removal and washing out of the said cloths.]

18. Machine for Turning or Edging Bricks; Charles O. Farrington, Brewer, Maine.

Claim—The slats attached by joint hinges to the bars, A A, and connected by joint to the bar, F, which has the spring attached to it.

19. Escapement for Time-keepers; Charles Fasoldt, Rome, New York.

Claim—The employment of a straight lever and collateral hook, in the position and form described.

20. Machine for Making Wooden Troughs; Samuel T. Field, Worcester, Massachusetts.

Claim—Arranging the bearings of the saw and the mechanism by which it is driven, whereby the upper surface and also the interior of the saw is left unobstructed. Also, in combination with a cylindrical saw, a secondary cutter, arranged so as to groove the core of the stick while it is being sawed out by the cylindrical saw.

21. Cracker Machine; Joseph Fox, Lansingburg, New York.

Claim—1st, The depressions in the spaces between the grooves in one or both of the rollers that form the strips of dough from the sheet. 2d, Forming short sections of skin-covered strips of dough into disks or crackers, by pressure applied to ends of the sections, by the devices described. 3d, The rollers, by which the crackers are rolled on the apron, and by which the skin on the upper surface of the pressed crackers is improved. 4th, The combination of the straight edges for evening the rows of crackers before rolling, and also for docking with the dockers. 5th, The employment of the clamp bars, in combination with the knife, to cut off and hold the sections of the strips of dough, as the strips are fed through the bar. 6th, The plane, follower, and second endless apron, as combined and arranged among themselves, and with the other endless apron, for the purpose of taking rows of crackers from a moving endless apron, and placing them upon the bake-pans.

22. Slide Valves for Steam Engines; James Freeland and R. H. Lecky, Allegheny, Pennsylvania.

Claim—1st, The arrangement of the armed flanch on the steam pipe, the columns, the studs, with nuts,

and the cap, the whole being arranged and secured to the valve seat, as described. 2d, The arrangement of chamber with opening, as described. 3d. The combination and arrangement of the armed flanch on the steam pipe, columns, studs, with nuts, stuffing-box, cap, and slide valve, with the valve seat, arranged as described.

23. Handles for Table Cutlery; J. W. Gardner, Shelburne Falls, Massachusetts.

Claim—A table knife having its handle composed of two or more parts, the ends of which are encompassed by ferules, and otherwise constructed as described.

24. Spermatic Rings; Dwight Gibbons, Rochester, New York.

Claim—The employment in a ring encircling the penis of a sharp pin or point attached to a spring which is held by a roller, or other equivalent rest, so as to prevent the protrusion of the said pin within the interior surface of the ring till distension of the penis occurs, and by its action on the spring causes its liberation from the roller or rest, and thereby permits the said spring to force the pin or point into the penis, with a sudden action, instead of with the gradual action peculiar to the points of other rings for the same purpose. 2d, The combination of the two semicircular or nearly semicircular springs, with the two rigid sockets, by means of a slot and set-screw in one of the sockets, which permits the ring of the instrument to be adjusted to organs of various sizes.

25. Railway Chairs; J. W. Gould, Elmira, New York.

Claim—The self-securing "lock wedge," arranged in combination with the rails, chair seat, and key, in the manner specified.

26. Retorts for Distilling Coal Oil; N. B. Hatch, Lawrenceville, Pennsylvania.

Claim—The application and use in retorts used in the distillation of coal, or other substances, from which oil or gas is producible, of a sweep bar or arm with plates attached, and operated so as to push or spread the material placed within over the floor or bottom, and at intervals discharge the same continuously in openings at or near the edge of the retort.

27. Scrubbing Pail; A. P. Hawse and L. J. Adams, Morrisville, Vermont.

Claim—The combination of pail, rollers, and pieces, as set forth.

28. Shirt Collars; G. W. Beard, Boston, Massachusetts.

Claim—As an improvement in the "turn down collar," the construction of the same with four cravat slots or passages, arranged therein or with respect to the ends of the inner fold of the collar, and for the purpose of receiving a cravat or tie ribbon. Also, the described mode of applying or arranging a cravat or neck tie in the collar, constructed with the four slots or passages arranged within it or with respect to the ends of its inner fold, essentially as explained.

29. Washing Machine; John Hebden, Medford, Massachusetts.

Claim—The machine constructed with a removable dasher, or its equivalent, and a removable platform, combined and arranged with the suds reservoir and mangle rollers, as set forth, the whole not only enabling the operations of washing the clothes, expressing the water from them, and mangling them to be carried on consecutively, but causing clothes to be drawn out of the suds reservoir, and the express water to be received into it.

30. Mill for Grinding Cane, &c.; Isaac A. Hedges, Cincinnati, Ohio.

Claim—1st, Surrounding the openings in the top and bottom plates with annular ledges, when employed in connexion with rollers having recesses corresponding with them in their top and bottom ends. 2d, The regulator and adjuster. 3d, The oil tubes, when used in connexion with a recess containing waste oil, to conduct the same through the rollers to the bearings below 4th, The corrugated shells, in combination with the rollers, for the purpose of readily converting the mill into a corrugated mill.

31. Clothes Frame; Dexter Henshaw, Fitchburg, Massachusetts.

Claim—The combination of the four arms and the block with the cords, screws, and braces, as described.

32. Machine for Grinding and Polishing Saws; J. A Hendricks, Providence, Pennsylvania.

Claim—The grindstone or emery wheel, in combination with the feed rollers placed in the adjustable frame, as set forth.

33. Rotary Harrows; W. T. Hildrup, Harrisburgh, Pennsylvania.

Claim—Giving the sleeves an invariable connexion at one extremity, and a variable connexion attached to the draft bar at the other.

34. Machine for Making Meal and Flour; G. W. Holman, Beloit, Wisconsin.

Claim—Placing a series of knives supported by gudgeons in a circle, or part of a circle, so that the thickness of the shaving cut by the edge of one knife shall be gauged by the back of the knife next to it. Also, placing a series of knives, supported by gudgeons, so that the rankness of set of all of them may be uniformly graduated by one operation, and so that their faces may be thrown back into one uniform surface for grinding or sharpening. Also, the band at the end of the knives, constructed as described. Also, the arrangement of the reversed screw threads on the arbor, and the reversed screw threads on the core, for the purpose of moving grain in opposite directions at the aame time, as combined with the other parts of my machine.

35. Mill for Grinding Grain; Wm. H. Hope, Washington City, D. C.

Claim—1st, The combination of a cylindrical corn and cob cutter and crusher for grinding food for cattle, with two sets of grinding surfaces, arranged as set forth. 2d, The arrangement by which the cylindrical rollers or cutters and crushers and grinding surfaces may be operated together or separately, as described. 3d, The mode of regulating the cylinders and stone for the purpose of grinding coarse or fine, by the use of the screw lever attached to the journal boxes, which move on ears or lugs firmly attached to a frame, in the manner described.

36. Apparatus for Regulating the Draft of Engines; W. S. Hudson, Paterson, New Jersey.

Claim—1st, The interposition of a perforated diaphragm between the steam and exhaust pipes, and extending down to or near the level of the lower tubes. 2d, Making the apertures above the base of the diaphragm of such area that when the locomotive is standing still, the gaseous products of combustion may flow through without serious obstruction, but that when the combustion is increased by the blast, a large portion is compelled to pass underneath.

37. Ovens; George C. Jennison, Ware, Massachusetts.

Claim—The application of the baking chamber of the endless carrier to the furnace, in such manner that the air within the said baking chamber may come into direct contact with the furnace charge or heated volatile products arising therefrom, and be heated thereby without the heat having first to pass through any divid-

ing wall or partition, or its equivalent. Also, the arrangement of the baking chamber with respect to the furnace and its discharge flues, whereby the advantage of the ascending power of the heat is availed of, while the smoke is carried off by the flues. Also, the arrangement of the charging and discharging orifices of the baking chamber, with reference to it and the lower smoke eduction passage leading into the discharge flue of the oven. Also, the arrangement and application of the pendulous platforms and the endless carrier, together and within the vertical baking shaft. Also, the combination and arrangement of one or more openings and their dampers, with the baking chamber and its furnace and flues.

38. Weighing Scales; O. W. Jipson, Rochester, New York.

Claim—1st, The sliding block, when provided with the rollers and slide or supplemental weight, arranged with or without the rack and pinion. 2d, The adjustable block, provided with the slide or weight and graduated bar, in combination with the nut or supplementary weight. 3d, The attachment of the lever to the platform frame, whereby the same may be adjusted farther in or out from the frame, as circumstances may require. 4th, The arrangement of the bars with their sockets and with the frame, to admit of the adjustment of the bars to receive platforms of greater or less size, as required. 5th, The employment or use of the sleeve attached or applied to the beam.

39. Floating and Revolving Derrick; E. Jones, Brooklyn, New York.

Claim—The arrangement of the turn-table or frame, which carries the derrick, when placed on the bottom of the scow or below the deck. Also, supporting the upper turn-table or frame of the derrick, by means of a circle and wheels.

40. Horse-shoe Machine; Wm. W. Lewis, Cincinnati, Ohio.

Claim—1st, The combination in a pair of rolls of a groove and creasers, which will, by their joint operation, exert pressure in a lateral as well as a longitudinal direction. 2d, In combination with the above, dividing the rollers radially and vertically.

41. Tool for Crozing and Chamfering Barrels; H. Martin, Louisville, Kentucky.

Claim—The stock provided with the rollers, arranged so as to be capable of being adjusted longitudinally and laterally in the stock.

42. Apparatus for Increasing the Draft of Furnaces; J. B. Martin, Wilmington, North Carolina.

Claim—1st, The combination of a fan with the exhaust when arranged within the smoke-stack, so that the exhaust steam, as it issues from the exhaust pipe, acts directly on the blade of the fan, and then passes with the products of combustion in a direct path through the fan and through the smoke-stack, thus causing the fan to turn with high velocity, and thereby accelerating the draft of the furnace. 2d, The combination of the deflecting plates with the blades of the fan, for the purpose of intercepting sparks and cinders.

43. Sleeping Cars; T. E. McNeill, Philadelphia, Pennsylvania.

Claim—1st, Constructing the seat of the swing seat of a railway car with guiding strips, or their equivalents, and padded leaves hinged together and to the seat, so that the latter may be extended and form a comfortable couch for sleeping purposes. 2d, The frame arranged to receive the padded board, when the frame is hung to one end of the couch, and the board to the opposite end by rods, and when the whole is combined with the swing seat of a railway car, so as to form a rest for the back during the day, and a sleeping couch for the night.

44. Coffee Pots; C. A. Merchant and G. L. Patterson, Frankfort, Kentucky.

Claim—The combination and arrangement of the cylinder in the reservoir and the tubes, in the manner described.

45. Clover Pickers; Wm. T. Mills, Galesburgh, Michigan.

Claim—Providing the teeth with the holes and angular plate, when arranged at the front edge of the adjustable platform or box, and in relation to each other, in the manner described.

46. Discharging Water from Floating Dry-docks for Canals; Stephen F. Palmer, City of New York.

Claim—The manner of discharging the water from a floating dock by means of the underground trunk, in combination with the flexible apparatus to convey the water from the dock without interfering with its rise and fall. Not confining myself to any particular manner, provided it produces the same result of giving the water a self-acting discharge.

47. Variable Exhaust Pipe; Wm. P. Parrott and Stephen H. Head, Boston, Massachusetts.

Claim—The contracting orifice for blast pipes, in the manner set forth.

48. Variable Exhaust Pipe; Jones Patrick, Chicago, Illinois.

Claim—In combination with a revolving cylinder or plate of variable-sized exhaust openings, the rock shaft, pawl radius bar, and their several connexions, in the manner set forth.

49. Sash Supporter; John F. Peabody, Salem, Massachusetts.

Claim—My arrangement of the rack bar with reference not only to the groove of the window frame, but to the inner side of the sash and to the catch applied thereto, the rack-bar, under such arrangement, not only being in full view with the catch, at any altitude in which the window sash may be placed in the frame, but operating not only to support the sash at such altitude, but to maintain it within the groove.

50. Photographic Plate Vise; Sylvester W. and Washington L. Pearsall, City of New York.

Claim—The spring rocking jaw and lever, in combination with the movable jaw. Also, the jaw pieces or facings of hard rubber or gutta-percha, for the purposes specified. Also, the arrangement of the rod, stock, and gudgeon, entering the socket, and having the set-screw, by which the apparatus is retained in position horizontally.

51. Cotton Bale Hoops; G. W. Penniston, North Vernon, Indiana.

Claim—The tye or friction key, constructed with convex inner bearings, in the manner specified.

52. Harvesters; Sylvester Persons and Alfred W. Cone, Panama, New York.

Claim—1st, Arranging and operating the chain cutters upon an adjustable and vibrating cutter frame, in the manner described. 2d, The arrangement of two or more rollers relatively to the chain cutters, multiplying wheel, and adjustable vibrating cutter frame, so that the rollers will form a bearing for the chain cutters, and support and hold the chain in gear with the multiplying wheel, whatever may be the position of the adjustable vibrating cutter frame in passing over unlevel surfaces.

53. Fanning Mills; J. E. Rice, Oneida, New York.

Claim—The arrangement and combination of the suction chamber, spouts, plate, and shoe, as described.

54. Filtering Apparatus; Nathan F. Rice, New Orleans, Louisiana.

Claim—1st, Passing the water through the filtering medium from below upwards, in the manner specified. 2d, The concavo-convex perforated false bottom or diaphragm, constructed as described. 3d, The air tube leading from the lower chamber, as specified.

55. Fire and Ventilating Apparatus for Ships; John W. Richards, City of New York.

Claim—1st, Arranging and applying the pipes, or their equivalents, leading to the different parts of the vessel, in combination with suitable connexions with a boiler and a blower or air-forcing apparatus, that the said pipes may be used as required, to supply either air for ventilation or steam for the extinction of fire. 2d, Applying the several lengths of pipe in a train so that they are capable of being turned in their joint boxes or supports, for the purpose of giving such direction to the ventilating air supplied by each length, as the occupants of the berth or part of the vessel supplied by it may desire.

56. Ovens; Thomas Russell, City of New York.

Claim—The employment in an oven, in combination with permanent ways or tracks, arranged at right angles to each other within, without, and through the door-ways, and with a series of carriages to run on such ways, of a system of horizontal screws and endless chains, and of teeth, or their equivalents, on said carriages, to connect with said screws and chains. Also, the opening of the oven doors to admit and permit the exit of the carriages by the direct action of the doors of the carriages themselves, thereby dispensing with special machinery for that purpose.

57. Burr Stone Mills; Gelston Sanford, Poughkeepsie, New York.

Claim—1st, The mode of constructing the casing or shaft with a vertical or upright joint, in combination with the lever and edges as a fastener for the shell. 2d, The grinding part and the elevating part, in combination with the cone and shell, in the manner specified.

58. Hinge; Samuel S. Squire and Theodore Scharfenburg, Brooklyn, New York.

Claim—Providing the half leaves on one side of a butt with the hinge pins, which are sold with the pattern and form part thereof, when cast in the manner specified.

59. Dressing Mill-stones; Alfred Sheek, Smith Grove, North Carolina.

Claim—In combination with a plane surface land, the depression, and convex furrow or surface, in the manner described.

60. Rotary Steam Engine; H. B. Thomas, Portage City, Wisconsin.

Claim—1st, So constructing and combining a piston wheel and sliding pistons with two eccentric cylinders, one outside and the other inside the said wheel, that with a proper arrangement of induction and eduction passages, those parts of the pistons within the rim of the wheel, as well as those without, are rendered effective in the operation of the engine, and it is thereby rendered double-acting, either in its employment as a motor or as a pump, or as a combined motor and pump. 2d, The combined arrangement described, of the passages and cavities in the cylinder head, ring valve, and bonnet.

61. Sewing Machines; Wm. W. Wade, Longmeadow, Massachusetts.

Claim—The application to sewing machines of the ratchet or corrugated wheel and pawl, the pawl being kept in place by a friction cam, or its equivalent, and the motion being communicated to the machine, either by a double crank or by a single crank, or other appropriate means.

62. Machine for Grinding Saws; George Walker, Port Jervis, New York.

Claim—1st, The arrangement and combination of the wheel and bed-plate, whereby said driving wheel is made to drive the bed-plate, and also to compensate for the pressure of the grindstone. 2d, The flat-bottomed water recess in the face of the bed-plate, as shown.

[This invention consists in supporting saws during the operation of grinding them, upon a horizontal bed arranged below the grindstone, by which means the chattering of the saw, and consequent waviness of its surface are obviated, and the water used in grinding, and what is termed the "cut," viz: the particles of stone worn off in the grinding process, are prevented flying away from the place of grinding, and by that means the grinding process expedited. It also consists in suspending the grindstone above the saw bed in such a manner that as much of the weight of the grindstone, and no more than is desirable, may be allowed to bear on the saw, and the grindstone is made to bear heaviest on the thickest parts of the saw, and thus sooner grind it to a uniform thickness than when the saw is applied in the usual manner. It further consists in a certain method of applyling the power to drive a rotating saw bed for grinding circular saws, that the driving gear serves to confine the bed to the grindstone, and prevent the bearings of the bed wearing out of plumb.]

63. Sizing for Colored Papers; Charles Williams, Philadelphia, Pennsylvania.

Claim—The employment or use, in a sizing for marbled and other colored papers, of the solution of the gum resin lac, in combination with a solution of either soap or bees-wax, or both, the said solutions being made and incorporated together in the sizing, in the manner described.

64. Cast Iron Pavement; Chapman Warner, City of New York.

Claim—The mode of constructing pavements of iron frames of any size, substantially of the form described, placed at right-angles to each other, each surmounted by a single boss, which constitutes the traveling surface, it being so arched and placed upon the frame, and the frames so connected with each other, that the pressure arising from a weight imposed upon any boss, or upon any part of it, shall not be borne exclusively by one part of the frames, but shall be diffused over it and over the adjoining frames, the manner of connexion at the same time preserving the regularity of the surface, by preventing the elevation or depression of any one boss above or below the surface of the others, the space left by the frames to be filled with any material which the circumstances of each particular case may determine.

65. Machine for Shaving the Heads of Screw Blanks; Awrin Wood, Worcester, Massachusetts.

Claim—The wheel with its volute and twisted slot, in combination with the ways, or the equivalent thereof, to present the blanks in order, by means of which combination the blanks are separated one by one, and gradually brought to a horizontal, or nearly horizontal, position. Also, in combination with the wheel, having a volute and twisted slot, for receiving the blanks one by one from the separating wheel. Also, the combination of the inclined ways, the separating wheel, with its volute and twisted slot, the feeding tube and punch rod, or the equivalent thereof, with the jaws on the mandrel. Also, communicating motion to the separating wheel by an interposed spring spur or catch, or the equivalent thereof, that the spring connexion between the impelling mechanism and the separating wheel, or its equivalent, may yield to any obstruction, and thus prevent injury to the mechanism.

66. Stereoscopic Apparatus; James Lee, Assignor to self and Milton Finkle, City of New York.

Claim—The fan or segment hinge, or its equivalent, in combination with the picture-holders, for the pur-

pose specified. Also, the controlling band, or equivalent. Also, the elastic band, or its equivalent, in combination with the pulley and rollers. Also, the picture-holder, as described. Finally, the combination as set forth and described, but do not confine myself to the exact proportions, as I may vary the same while I obtain the same end, by means essentially the same.

67. Meat Cleaver; Ezra Pollard, Albany, New York, Assignor to self and Joshua Gray, Westfield, Mass.

Claim—The meat masticator, in combination with the cleaver, substantially as specified.

68. Fly-trap; Reuben Shaler, Madison, Connecticut, Assignor to George W. Shaler, City of New York.

Claim—The combination of the stud and cover, when arranged in connexion with the chambers, as described.

69. Harness Saddle-trees; Samuel E. Tompkins and John Maclure, Assignors to Samuel E. Tompkins, Newark, New Jersey.

Claim—The tubular projection on the bow of the tree, so as to form a case for the bolt, and permit the securing of the wooden seat block to the tree, without injuring the same or allowing it to work loose, and at the same time securing the check-rein hook to the tree.

70. Machinery for Cutting Files; Milton D. Whipple, Charlestown, Massachusetts, Assignor to the Whipple File Company.

Claim—1st, The circular rolling cutter, operating in the manner set forth. 2d, Holding the face of the blank which is being cut, up to a face plate or rest by pressure upon its opposite sides. 3d, Clamping the blank rigidly, while a cut is being made, and releasing it preparatory to its being fed. 4th, The wedges operating as set forth, for the purpose of clamping the blanks. 5th, The sheld against which the blank rests, and which is fed up with the blank, in the manner set forth. 6th, The machine for cutting files, consisting essentially of the combination of the elements above claimed, and operating in the manner set forth.

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71. Machine for Making Rivets, Bullets, &c.; C. B. Allen, Philadelphia, Pennsylvania.

Claim—The revolving shaft with their inclined planes and former, and the mould wheels or formers attached thereto, in combination with the yoke and wheels, whereby the extremities of the shafts to which the mould wheels or formers are attached, are made to approximate and separate. Also, the bar and the inclined plane, in combination with the rod and cutter wheel, whereby the portion of metal which has been moulded or formed may, when so desired, be severed or detached.

72. Railroad Safety Switch; Giles S. Appleton, Burlington, Vermont.

Claim—1st, The combination of the broad and even switch rails with the broad and even traverse rails, long guide rails, and short lift and guide rails, when the same are arranged in relation to each other, substantially as described. 2d, Allowing the wheels to play upon the wide traverse and switch rails after leaving the short lift ways and guide rails, before they reach the main track.

73. Method of Opening and Closing Gates; J. A. Ayers, Hartford, Connecticut.

Claim—The counterpoised or loaded platform, formed of two parts, connected by joints or hinges, and placed in the carriage way beneath the gate, and extending a requisite distance at either side of it, when said platform is connected by suitable mechanism with the gate to operate said gate. Further, in connexion with the platform, the locking device formed of the drop bars, and the jointed levers connected with the bars, which are provided with the upright arms extending upward through the platform.

74. Sawing Machine; Benjamin Barker, Ellsworth, Maine.

Claim—1st, The saw-dust spout, arranged relatively with the edging saw and feed table, as set forth. 2d, The trimming saw, when used in connexion and arranged relatively with the edging saw to operate conjointly therewith, as described.

75. Earth Excavators; Joseph P. Barker, Wayne, Ohio.

Claim—The manner of arranging and adjusting the apron, and operating the same by means of the bent levers, for the purpose of conveniently discharging the earth taken up at any desired point, and used in connexion with the adjustable wheels.

76. Steam Ploughs; Samuel K. Bassett, Galesburgh, Illinios.

Claim—Having the wheels of the truck attached to separate axles with pivoted or swiveled inner bearings, the outer bearings of the axles being fitted in guides, and the outer ends of the axles being connected by rods with racks, into which pinions of shaft gear, the shafts being connected by the endless chains passing around cone pulleys placed in reverse positions on the shafts, being arranged to facilitate the guiding and turning of the machine.

77. Billiard Register; Henry J. Behrens, City of New York.

Claim—The use of numbers instead of balls—technically called "points"—so arranged and worked by mechanism that any number of points made by the player may be readily marked on the number itself, and the amount of the thus successively marked points is made to be shown by the register by mechanism.

78. Monumental Daguerreotype Cases; Jacob Bergstresser, Berrigsburgh, Pennsylvania.

Claim—The combination of the central frame encased by a central raised bead on the rear side of a glass plate, with the outer frame encased by an outer raised bead, the central frame and outer frame being cast together on the same glass plate, and the outer one being deeper than the inner or central frame.

79. Coffee Pots; E. H. Covell, City of New York.

Claim—1st, The combination of the chamber with the condensing chamber and condensing pipes. 2d, The combination of the condensing pipes with the steam pipe and trap, as described.

80. Application of Electricity in Dental Operations; Wm. G. A. Bonwill, Dover, Delaware.

Claim—In the application of electricity to dental purposes, the mode described of extracting or extirpating the dental pulp or internal nerve of teeth, to wit: by the application of a current of electricity through the instruments made use of in the performance of said operation, directly and constantly to the dental pulp or internal nerve, during the operation of cutting out or extracting the same.

81. Photography on Wood; Charles B. Boyle, Albany, New York, patented in England, Jan. 7, 1859.

Claim—1st, The described or substantially equivalent method of applying albuminous matter, and afterwards coagulating it by heat, so as to form an insoluble base within the pores of the wood. 2d, Taking pho-

tographic pictures upon wood, the pores of which have been filled with gelatine, or its equivalent. and subsequently removing the gelatine from the block without injury to the picture by the application of a warm solvent.

82. Machine for Riving Laths from the Block; J. L. Brown, Indianapolis, Indiana.

Claim—The combination and arrangement of the yoke, knife, plate, guides, with the pitmans, elbow levers, and rests, constructed as set forth.

83. Manufacture of Rubber Hose Pipes; John H. Cheever, Boston, Massachusetts.

Claim—The new article of manufacture. consisting of hose or pipe made of fibrous rubber by powerful pressure, and without seams or joints, as described.

84. Harvesters; George E. Chenoweth, Baltimore, Maryland.

Claim—The combination of the cam cylinder with the cross arm, slide bar, and slotted or jaw lever, constructed in the manner specified. Also, a slide bar having two cross arms provided with friction rollers, and working in the slotted box.

85. Valve Bung; Florian Dahis, Williamsburgh, New York.

Claim—A bung provided with an air passage terminating in a recess or chamber, in which a disk valve of rubber, or other suitable material, is placed, and secured therein by a plate provided with a hole, specifically as set forth.

86. Washing Machine; Beriah Douglas, Appleton, Wisconsin.

Claim—The washing seat and the foot box as combined with the washing rocker and the hand supporters, and the clothes holder or wringer as combined with the washing tub.

87. Cultivators; James Dundas, Little Rock, Illinois.

Claim—The arrangement of the half shovels in connexion with the bar, to be moved to the right or left at the pleasure of the operator.

88. Cultivators; George Essington, Plainfield, Illinois.

Claim—The arrangement of the mould boards and centre-piece, in combination with the coulter or standard, point, and shares, constructed as described.

89. Furnace for Smelting Iron; Squire M. Fales, Baltimore, Maryland.

Claim—The combination with the ordinary furnace of the arched chambers or recesses at the sides of the furnace, the opening in the crown of the arched recess or chamber, and the movable tymp at the external openings of the arched chambers or recesses, as specified.

90. Cattle Pumps; Daniel P. Farnham, Johnstown Centre, Wisconsin.

Claim—1st, The combination of the lever and rod, or their equivalents, with the gate and inclined platform, arranged as described. 2d, The strips of metal secured on the inside of the barrel of the pump, to prevent the valves from coming in contact with the plunger as it works up and down, in combination with the barrel. 3d, The packing ring, constructed as described, and kept up to the plunger by weights on the back side.

91. Mortising Chisel; J. B. Fisher, Beaver Dam, Wisconsin.

Claim—Constructing the tool with two cutting edges or portions of different lengths, as described.

92. Manufacture of Cast Steel; Perry G. Gardiner, City of New York.

Claim—It is not simply the gradual and prolonged cooling of the metal after melting, as aforesaid—but the process as a whole of pouring the melted metal into intensely heated moulds, and then placing them, thus filled, immediately into the heated oven or furnace where they congeal, away from the external atmosphere, down to a cherry red heat, and then immediately plunging the ingots or bars into the highly heated oil, and retaining them immersed in it for a considerable time, as described.

93. Manufacturing Tools from Cast Steel; Perry G. Gardiner, City of New York.

Claim—The process of treatment of the cast steel, by pouring it in a molten state into moulds of the shape and size required for tools, instruments, axes, &c., previously heated to a high degree of heat, the steel being melted in a closed oven or furnace, and then replacing the moulds so filled in an oven or furnace, away from the external air, and keeping them there until they have been cooled down to a cherry red heat, and then immersing the tools, axes, &c., into the fluid mixture of a temperature of from 100° to 150° Fah., as described.

94. Gun Lock; J. A. Lowe, City of New York.

Claim—The rule joint, or its equivalent, in the link, as described.

95. Mail Bag Fastening; John C. Garland, Chicago, Illinois.

Claim—The employment of a slotted sliding strap, when made of a single steel spring, and used in combination with a series of narrow stationary iron guides, attached to the perforated flap of the bag, and with a steel spring having headed stop pins fitted between the front portion of the binding and the upper edge of the mail bag.

96. Rotary Spading Machines; George W. B. Gedney, City of New York.

Claim—A series of spades which are operated so as to descend edgewise into the soil successively in each others track, and then to move laterally to detach the slice of soil upon which they operate from the undisturbed land. Also, combining an endless series of spades, operating with a cam, or its equivalent, that controls their positions by means of spade handles, or their equivalents, that are connected with the blades of the spades. Also, adapting the machine to be moved either end forward, by constructing the device that imparts lateral movement to the spades in such manner that its position may be changed, and that it may be made fast in either position.

97. Skirt Hoops; James C. Gilbert, Winthrop, Maryland.

Claim—In connexion with the movable spools and springs placed or strung on the cord, a series of stationary abutment blocks fastened at intervals to the cord, and operating in manner specified.

98. Padlocks; John A. Goewey, Albany, New York.

Claim—The combination of the tumbler having attached to it the spring, with the tumbler having attached to it the stump, when arranged in the manner set forth.

99. Arms of Broadcast Seeding Machines; Henry J. Hale, Indianapolis, Indiana.

Claim—The combination and arrangement of the segments and hinge, constructed as set forth.

100. REFRIGERATOR; Samuel Hickok, Buffalo, New York.

Claim—The combination of the tube arranged with the tank, when combined with the case, as described.

101. DOOR LOCK; Joseph S. Hoard and Valorus O. Spencer, Mansfield, Pennsylvania.

Claim—1st, The combination of the key with the flanch and plate, by which the key is made to operate as a detent to prevent the return of the plate, which covers the outer key-hole. 2d, The combination of the stop upon the bolt with the key, in such a manner that when the key is in the position represented, the stop will strike against the key and prevent the return of the bolt. 3d, The stop on the flanch, when combined with the key, in the manner described, to prevent said key from being turned too far.

102. SOLE-CUTTING MACHINES; A. P. Howard and Allen Rowe, Jr., Stoneham, Massachusetts.

Claim—Arranging the sole-cutter on the lower end of, and at right angles to, a vertical shaft, and combining with such mechanism not only for elevating and depressing such shaft in line of its axis, but mechanism for producing successive semi-rotations of such shaft and cutter, the same operating so as to carry the sole-cutter toward and away from the bed, and to give to such cutter an intermittent rotary motion. And in combination with the mechanism for elevating and depressing the cutter, and that for rotating it under an arrangement of the said cutter, with respect to its shaft, we claim the guide tooth and the clutch recesses, arranged to operate in manner set forth. Also, the combination and arrangement of the concave sole-discharger and the convex sole former or bender with the cutter, and so as to operate together in manner specified.

103. DOOR SPRINGS; G. L Hudson, Conneaut, Ohio.

Claim—The use of the standard, coil spring, stirrup, crotch lever connected with rod, link as operating vice-versa to gate or door, arranged or connected in the manner set forth.

104. LADIES' HOOP SKIRTS; Frederick Hull, Derby, Connecticut.

Claim—The combination of the sloping bustle springs, with the waist-band adjustable at the back and front, whereby the adjustment of the bustle is effected by the waistband alone.

105. SURVEYING INSTRUMENTS FOR DETERMINING INACCESSIBLE HEIGHTS AND DISTANCES; Marshall Angersoll, Grafton, Ohio.

Claim—The construction of a surveying instrument for taking distances and altitudes upon the general principle set forth. Especially, the arrangement of the three sights, or their telescopic equivalents, one of which is adjustable upon a scale, by which means and the adjustment of a target having the same horizontal scale, the distance of any object within the range of vision can be determined. In this claim I do not intend to confine myself to the precise arrangement set forth, but to use a telescope in which a similar adjustment of hair sights (or filaments of silk) are provided for upon a definite scale; neither do I intend to confine myself to any particular scale, but to adopt a decimal scale, or any other that I may see fit. I claim, especially, a horizontal target, having marked upon it a scale corresponding to that of the accompanying instrument, which target is to be used in connexion therewith. Further, the scale of altitude, in combination with the scale of distance to be used, in the manner specified.

106. DEEP SEA SOUNDING APPARATUS; Augustus Jonan, San Francisco, California.

Claim—The combination and arrangement of the several essential devices described, operating in the manner set forth.

107. METHOD OF VARNISHING AND PROTECTING SURFACES; Frederic Kuhlman, Paris, France.

Claim—1st, The process described of fixing the surfaces of fabrics (fibrous or textile,) or solid surfaces, as walls or masonry, by the application of a weak solution of an alkaline silicate, as the silicate of potash and soda, to said paint basis. 2d, For a similar purpose, the method described of laying a coating of artificial leather over the surface of the basis pigment. 3d, The described method of fixing and rendering printed papers and fabrics water-proof, and fixing the same by hot calendering. 4th, The described method of rendering the surface of plaster of Paris water-proof, and of preserving the same, by forming a coating of artificial sulphate of baryta upon said surface.

108. CHURN; Rufus Lapham and R. P. Wilson, City of New York.

Claim—The use of an exhausting or condensing pump, in connexion with the cream reservoir, for the purpose of forcing air upon the upper surface of the cream, or withdrawing it from it, in the manner described.

109. WATER WHEEL; C. V. Littlepage, Austin, Texas.

Claim—The wheel provided with curved buckets and attached to the shaft stepped in the block, and otherwise arranged as shown, in connexion with the spiral water passage in the block or bed.

110. MACHINE FOR RIVING STAVES FROM THE BLOCK; L. Lyman, James P. Hodgkins, and E. Rawson, Carthage, New York.

Claim—1st, Having the tubes of the rods or gauges fitted in blocks, which are adjusted by the screws, or their equivalent. 2d, Placing the rods or gauges in tubes in the lower end of which springs are placed, and on which springs the rods rest, for the purpose set forth.

111. ALARM CLOCKS; J. F. Mascher, Philadelphia, Pennsylvania.

Claim—The application of the rack, pinion, and snail, in the manner set forth, to the going part of a clock or watch, for the use and purpose described.

112. PADDLE WHEEL; John May, Columbus, Georgia.

Claim—So applying and arranging a frame outside of the wheel, and in combination with the axle or centre on which the floats rotate, or its equivalent, that the said frame may be turned about the wheel, and by being so turned will change the position of the said axle or centre, or its equivalent, relatively to the centre of the drum, and thereby cause the floats to be projected from the drum, in such positions relatively to the axis thereof, as may be desired.

113. HARVESTERS; Wm. K. Miller, Canton, Ohio.

Claim—The combination of the braces and rocking bar, as set forth. Also, the adjustable hinge plate, for the purpose described. And, finally, the combination of the shoe hinge plate, braces, and rocking bar, in the manner described.

114. STOVES; N. W. Northup, Greene, New York.

Claim—In a stove, constructed as described, the combination and arrangement of the partition with the flues and dampers, in manner specified.

115. SOOT AND SPARK ARRESTER; Washington Abram Peaslee, Indianapolis, Indiana.

Claim—The combination and arrangement of the cap, rod, walls, G F and Q, with the case or outer wall, C, flues, and wall, D, constructed in the manner set forth.

116. DEVICE FOR PREVENTING TREMULOUS VIBRATION OF SAW GATES; David Reynolds, Ogden, Indiana.

Claim—Combining the guide bar and boxing with the sash saw and fender posts, as described.

117. THE PROCESS OF MANUFACTURING CAUSTIC ALKALIES; Henry Pemberton, East Tarentum, Pennsylvania.

Claim—The mode described of separating the solution of caustic soda, or other caustic alkaline liquid, from an insoluble precipitate, by the use of a filter, constructed in the manner described.

118. HEEL AND SPOKE SHAVES; Joseph A. Perley, Lynn, Massachusetts.

Claim—The combination and arrangement of the adjustable gauge and beveled shanks, so that the gauge may be moved in a plane but slightly inclined to the convex side of the knife toward the edge or from it.

119. CARPET-SWEEPER; N. B. Pratt, Deep River, Connecticut.

Claim—The arrangement of the bearings of the friction driving rollers in oblong slots of the box, and the rollers, in the specified relation to the ends of the revolving broom or brush.

120. MANUFACTURE OF CHEESE; T. A. Redington and G. McCluer, Fredonia, New York.

Claim—The combination of the water-box, milk vat, the reserve water-box, boiler, pipes, and the six-way cocks, arranged to operate as set forth.

121. MACHINES FOR STRETCHING LEATHER; Albert W. Roberts, Hartford, Connecticut.

Claim—The constructing of the jaws of leather-stretchers with ways for the wedges to slide on, that the wedges may be so relieved from the leather when drawn back, that the leather can be put in without removing the wedge from the jaw. Also, making the frames of hollow tubes on which the jaws slide, and also the application of steam to said frames, for drying purposes. Also, the shaft and gears for throwing back the wedge.

122. CORN HUSKERS; Wm. N. Rowe, Sharpsburgh, Maryland.

Claim—The combination of the adjustable plate armed with spikes, with the endless apron and knives, constructed in the manner described.

123. SKATES; N. C. Sanford, Meriden, Connecticut.

Claim—Attaching the runner of the skate to its stock by means of the springs, as set forth.

124. CAST IRON PAVEMENT; S. T. Savage, Albany, New York.

Claim—Combining the blocks by the peculiarly arranged dovetails cast on the blocks, and the locking pieces composed of heads and feet fitting between the blocks and into their dovetails, as described.

125. REFRIGERATOR; Wm. Sims, Dayton, Ohio.

Claim—The described arrangement of the ventilating passages communicating with the upper part of a receptacle, in the lower part of which are placed ice and articles to be cooled or preserved, and in whose lower part circulation of air is avoided, in the manner set forth.

126. CORN SHELLERS; J. P. Smith, Hummelstown, Pennsylvania.

Claim—The arrangement of the groups of short teeth, alternating with the smooth spaces, which are provided with the raised ribs, in combination with the sharp-edged teeth (with curved or straight edges), when arranged circularly in lines parallel with the axis of the wheel, and operating in connexion with the ear-holder, so as to act on the ears of corn nearly lengthwise thereof.

127. REGULATING THE TWIST IN THROSTLE FRAMES; Joel Smith, Northbridge, Massachusetts.

Claim—The expanding pulley, arranged to operate as described.

128. GRAIN WEIGHERS; John B. Stoner, Bennington, Illinois.

Claim—1st, The rotary hopper, constructed as described. 2d, Suspending the rotary hopper upon the lever or scale arms, as set forth. 3d, The arrangement of means described, for operating and controlling the valve or door to the shute of the stationary hopper. 4th, Operating the indicators by means deriving their motions from the weighted end of the scale arms, in combination with the springs, or their equivalents. 5th, In combination with the suspending of the rotating hopper, the suspending of the weight, as described.

129. SLUICE FOR WATER WHEELS; John Temple, Assignor to Temple, Mills & Stout, Middletown, Ohio.

Claim—The winged gates, arranged in combination with a series of scroll shutes, in the manner set forth.

130. WATER WHEELS; John Temple, Assignor to Temple, Mills & Stout, Middletown, Ohio.

Claim—The construction and arrangement in central discharge water wheels of buckets, which have the described compound cyma-reversa and downward and outward curve, whereby the water acts on the wheel by percussion, reaction, and gravitation, and escapes freely without back action.

131. MACHINE FOR TENONING SPOKES; Webster Thomas, Oxford, Ohio.

Claim—The combination of the beds, constructed with support piece, wedge, and the double series of cutters, in the same cutter bearer, the construction and operation being as described.

132. REVOLVING FIRE ARMS; John Walch, City of New York.

Claim—The revolving chambers or breeches, fitted with two ranges of nipples, and firing the respective charges in succession.

133. LASTS; Daniel M. True, Rockland, Maine.

Claim—As a fastening for last blocks, the bolt, when formed with the notches, and combined and arranged with the spring, the pin, and last hook hole.

134. UNDERGROUND GRAIN PLOUGHS; Augustus Watson, Walnut Run, Ohio.

Claim—So hanging a coulter to which a mole is attached, as that by revolving a key, or its equivalent, that restrains said coulter, and by advancing the plough, said coulter and mole will run out of the ground.

135. APPARATUS FOR SUPPLYING HYDRO-CARBON WITH OXYGEN; A. H. Webster, Hudson, New York.

Claim—The bellows actuated by the tappit wheels and attached to the chest, provided with a cover or weight and an eduction opening, combined and arranged as set forth.

136. BEE-HIVES; Wm. L. West, Elmira, New York.

Claim—The use of the opposing springs for the purpose of insuring a contact of the parts contiguous to the passage way, as described.

137. Apparatus for Drawing Water; Sylvanus A. Wheat, Franklin, New York.

Claim—Giving the barrel a longitudinal motion on the shaft, also connecting the valve to the rope by the rod.

138. Ellipsograph; Thomas Williams and Wm. C. Joslin, Fisherville, Connecticut.

Claim—The slotted bar, A, provided with the slide, the arbor passing through the slide, with the disk and slotted bar, D, attached, and the elastic bar, G, pivoted to the bar, A, and connected eccentrically with the disk, the bar, D, having the pencil stock attached, arranged as set forth.

139. Burglars' Alarm; John P. Wilson, Frankfort, and John F. Thomas, Ilion, New York.

Claim—1st, The employment in connexion with the described gun alarm, of an adjustable gimlet screw, which is secured in a dovetailed groove in the body while in use, and which is secured in the barrel or bore by a screw when not in use. 2d, The employment of the two sides between which the hammer falls, which serve to prevent particles of the cap from flying off, and at the same time forming a snug protection for the hammer, and causing a louder report of the cap.

140. Odometre; Thomas K. Work, Hartford, Connecticut.

Claim—The curved or segment weight pivoted to the arm, which is attached to the pinion, and fitted between the annular ledges, as set forth.

141 Instrument for Taking Altitudes of the Sun; Frederick Yeiser, Lexington, Kentucky.

Claim—The arrangement of the spirally slotted cylinder on a rotary frame, in such relation to a pin and to a strongly defined line, that it operates as specified. And in combination with the rotary frame, operating the cylinder by means of a toothed sector which gears into cogs, which are attached to the stationary disk, in the manner described.

142. Mechanism for Stopping Watches; John K. Bigelow, Assignor to Appleton, Tracy & Co., Waltham, Massachusetts.

Claim—The peculiar mode of making the ratchet, viz: with trapezoidal teeth, and with a notch in each of them. Also, the arrangement or application of the stop-lever with respect to the stopping stud and the ratchet, or so as to serve not only as a carrier and actuator of the former, but as a stop to the latter under circumstances as specified.

143. Seed Drills; Michael Boyer, Assignor to Charles S. Rohner and Wm. Gunckel, Germantown, Ohio.

Claim—Arranging the spring, ratchet wheel, ratchet, link, drag bar, arm, and discharge spout, in the manner specified.

144. Steam Condensers; John N. Dennison, Assignor to self, Joseph Dennison, and David Baker, Newark, New Jersey.

Claim—A feed-pump with its attachments and connexions, in combination with a condenser, arranged as set forth.

145. Stump Extractors; E. B. Hall, Woodbury, Assignor to self and Joseph C. Farley, Pine Grove, N. J.

Claim—As an improvement on the patent of J. S. Wood, the cam, when constructed in the peculiar manner described, in combination with the rods and their rejective rollers and hooks, arranged in respect to each other for joint action, as set forth.

146. Dies for Cutting Screws; Peter Hoffman, Rising Sun, Assignor to self and Samuel F. Covington, Indianapolis, Indiana.

Claim—The construction of a solid die, in which the bottom of the groove is so thrown up in the rear of the cutting point or edge of the same, as to avoid the friction occasioned by the rubbing upon the top of the thread, of the bolt cut or threaded.

147. Knife-sharpener; George Himman, Assignor to self and Charles Monson, New Haven, Connecticut.

Claim—The use of the two cutters when made susceptible of being adjusted to any desired angle, by means of a slot while using any portion of the length of the cutting edges. Also, the rest, in combination with the adjustable cutters, when the whole is constructed and fitted for use, as described.

148. Self-acting Cheese Press; William Leach, Clarkson, Assignor to self and George P. Tisdale, Chili, New York.

Claim —The pitman, arranged in combination with the pairs of cross-levers, so as to keep said cross-levers at equal heights at opposite ends of the press, and consequently at the same relative angle to the table in all positions, for the purpose of securing uniformity of pressure upon all parts of the articles pressed. Also, the combination of the rod, handle, and pawls, mounted in one pair of cross-levers, with the notches, or their equivalents, in the other pair of cross-levers, arranged in the manner set forth.

149. Moulding Paraffine Candles; Horatio Leonard, Assignor to self and H. Ryder, New Bedford, Mass.

Claim—The process involving the employment of a heated mould, and water and air-baths at temperatures, and in the manner mentioned.

150. Method of Covering with Fibrous Material Submerged Spiral Electrodes for Short Distances; Edward Maynard, Assignor to self, N. K. Slaughter, and Thomas E. Purdy, Brooklyn, New York.

Claim—Constructing submarine telegraph cables of metallic conductors, twisted in helical form, in combination with layers of cords or strings, parallel, or nearly so, with the axis of the cable, that are confined together, by serving or winding, and are saturated with water-proof non-conducting material, as set forth.

151. Boot-jack; L. J. Wicks, Assignor to self and T. Burbeck, Racine, Wisconsin.

Claim—The described boot-jack, with the tools formed on the rear or front of its arms, said arms being made to open or shut together, in the manner specified.

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152. Bee-hives; George C. Aiken, Nashua, New Hampshire.

Claim—The arrangement of the boxes in the hive, so as to form, with the case thereof, the auxiliary or bell glass chambers, as described.

153. Treatment of Hides and Skins; Joseph Armstrong, Woburn, Massachusetts.

Claim—In combination with the application and use of a press, in connexion with the impregnation of

the hide with grease by a peg-lined cylinder, or any equivalent means, the employment of scraps of hide or other suitable absorbents, in the press, and against the edges and other necessary parts of the hides, and so as, during the operation of the press, to absorb the liquor from such edge or parts on or in which it would be likely to remain.

154. Arrangement of the Feed Roller in Wood-planing Machines; H. H. Baker, New Market, N. J.

Claim—Arranging the feed roller with a vibrating shaft, box, slide, spring, and with necessary gearing, so that said roller may be kept to the work or moved out free from it without stopping the working or running parts of the machine.

155. Hydrants; Frederick H. Bartholomew, City of New York.

Claim—1st, The combination of the valve with the main valve and its fixed valve seat, arranged as described. 2d, The arrangement of chamber within the trunk of the hydrant surrounding the seat of the main valve, having a waste passage at the bottom. 3d, The arrangement of the waste passage, the waste plug, and rod, in combination.

156. Mole Plough; Moses Bales, Big Plain, Ohio.

Claim—The adjustable mole ploughs upon a cutting shaft, arranged as set forth.

157. Reefing and Furling Sails; Charles E. Bishop, Brooklyn, New York.

Claim—1st, The employment of supplementary sheets to the topsails, and other upper square sails of a vessel, in order that said sails may be kept more "flat," and that the strain upon the ends of the yard may be lessened. 2d, Constructing topsails with supplementary sheets, clew-lines, and leech ropes, and with a central tackle, by the employment of which in due order, the topsail may be reduced and secured in successive portions.

158. Carpet-stretcher; Isaac W. Bragg, Cincinnati, Ohio.

Claim—1st, The dog, operating to attach the stretcher to that part of the floor next the wall, toward which the carpet is to be stretched. 2d, The combination and arrangement of the trip-lever for disengaging the dog. 3d, The combination and arrangement of the apron, feet, and slides, operating in combination with the rake to prevent the teeth from grazing the floor. 4th, The combination and arrangement of the stock, dog, driver, and actuating worm.

159. Method of Operating Yielding Feed Rollers; Joseph H. Brinton, Westchester, Pennsylvania.

Claim—A pair of feed rolls, one of which is yielding, and both driven by the same screw shaft, and in gear with it at all times.

160. Skates; Thomas W. Brown, Boston, Massachusetts.

Claim—The rocker and angular heel or straight edge runner, and applied to the bearing plates, or their equivalent, so as to be capable of being reversed with respect to the same, and used with either edge downward, as may be desirable. Also, the application of the heel plate to the heel screw, so as to be adjustable on, or with reference thereto.

161. Stoves; James D. Bruner, Alton, Illinois.

Claim—1st, Connecting and arranging with an oven which has no bottom, and between which and the passages of the products of combustion there is no communication, and the fire-box of the stove, air chambers, or cells. 2d, Combining with a detachable grate surface the detachable air cells or chambers.

162. Instruments for Threading Needles; S. S. Burlingame, Warwick, Rhode Island.

Claim—The needle-threader, consisting of an internally-barbed elastic pronged fork.

163. Cultivator Teeth; Wm. P. and Theodore H. Ford, Concord, New Hampshire.

Claim—The cultivator teeth, formed substantially as specified.

164. Cut-off Valves for Steam Engines; Adam Scott Cameron, City of New York.

Claim—The employment of the trip hinged valves, with their hook rods and appendages for operating them, or the equivalents thereof, in combination with the slide valve for cutting off the steam in steam engines. Also, in combination with the slide and the trip hinged valve, the so forming the seat of the slide valve relatively to the steam passages in the slide valve, as to admit the steam to the under face of the hinged valve and balance the pressure before they are opened. Also, in combination with the slide and trip hinge valves, the employment of the adjustable cone, or its equivalent, to regulate the period of cutting off the steam. Also, the cone, or its equivalent, in combination with the eccentric tube, or its equivalent, as a means of adjusting the relative periods of closing the two valves, as set forth.

165. Harvesters; Daniel Clow, Janesville, Wisconsin.

Claim—Constructing the main supporting wheel thereof, in such a manner as to form therein an outer and an inner zigzag groove; but this I only claim when the said grooves have differently proportioned reaches, and bear such a relation to the T-headed sliding bar, and the other parts of the machine which are connected with said bar and with the cutting apparatus, that the number of the movements imparted to the cutter bar can be varied at pleasure by shifting the bearings of the said sliding bar, from one position to another.

166. Hames; Henry Cogswell, Greenwich, New York.

Claim—The application of the shifting slide to hames as they are now used, by means of which slide the point and position of the draft of the hames can be altered as desired.

167. Pen-holder; Benjamin Cole, Brooklyn, New York.

Claim—The construction of a pen-holder with three or more elastic shanks or fingers, so arranged that the spring of said fingers will hold the pen by pressing it against and under the shoulders of two lateral fingers, and thus admit the introduction of, and be adapted to, pens of any ordinary size or thickness.

168. Fire-proof Floors; John B. Connell, City of New York.

Claim—Constructing a fire-proof foundation upon a series of wooden girders, for the reception of a flooring surface formed of boards, or other suitable materials.

169. Breech-loading Fire Arm; Frederick Curtis, Saugus Centre, Massachusetts.

Claim—When a breech slide is used in connexion with the barrel of a fire arm, a movable breech, separate from the breech slide, and arranged and applied therein, so as to be adjustable to the rear end of the barrel. Also, the arrangement of the priming nipple and the touch-hole thereof, with respect to the movable adjustable breech applied to the breech slide, as specified, or with respect to the same, and a primer arranged in the stock, such arrangement being productive of advantages, as before-mentioned.

170. Railroad Car Springs; Augustus B. Davis, Philadelphia, Pennsylvania.

Claim—A spring composed of a box or casing, with a lid attached to the same by means of a bolt or bolts, the said box containing a number of spiral springs confined longitudinally between the bottom of the box and the lid, and retained in their proper position laterally by means of lugs, or other suitable devices, the said lid having a limited movement in the direction of the springs, but having no lateral movement independent of the box, so that each spiral spring may be independent of the other, although the whole act in combination, the entire spring thereby retaining its elasticity, even should one or more of its spiral springs be broken or damaged.

171. Shoe Lasts; John C. F. Deecken, City of New York.

Claim—The endless chain or band, in combination with a knife or knives, operated in the manner described.

172. Umbrella Fastenings; Charles DeSaxe, City of New York.

Claim—The arrangement of the bolt, operating without springs, and by a double or sliding and rotating motion, in combination with the tubes or sockets, for the purposes set forth.

173. Mode of Squeezing and Straightening Tobacco; Martin D. Elsom, Howardsville, Virginia.

Claim—Squeezing and straightening bundles of tobacco, with a view of their being afterwards "struck" by passing them through a straightening and compressing mechanism.

174. Churn; John U. Fiester, Winchester, Ohio.

Claim—The adjustable dasher, constructed with two blades, yoke spring, cross-tie, with slots and pins, together with holes and air cavities, operating as described.

175. Wrench; Daniel P. Foster, Shelburne Falls, Massachusetts.

Claim—Making the hinge joint between the stationary and movable jaw of the wrench at a, viz: by the projections on the stationary jaw, and the depression in the washer that is on the shank of the movable jaw, for the purpose of allowing the movable jaw to change its position in relation to the stationary one, as set forth.

176. Shackle of Telegraph Cables, &c.; George Gilmour, Chelsea, Massachusetts.

Claim—The telegraph cable or rope shackle, as constructed, with one or more jaws, and mechanism to operate the same. Also, combining either the wing or the knife, or both, with the shackle, so as to operate therewith in manner specified.

177. Cork-cutting Machine; George Hammer, Philadelphia, Pennsylvania.

Claim—The described arrangement of guiding rollers and sliding wedge, or their equivalents, in combination with the stop, constructed in the manner set forth.

178. Horse Power Equalizer; Gorges Hely, Laporte, Indiana.

Claim—1st, Connecting the eveners by a rope or chain that passes over a pulley at the centre of the shaft. 2d, In combination with the eveners, the method of connecting the points or parts to which the horses are hitched, and by which they draw, by means of a system of ropes or chains and pulleys connected with the draft bars.

179. Rotary Engine; Samuel Huse, Chicago, Illinois.

Claim—The cams with their steam and exhaust ports, in combination with the heads, pistons, and cylinder, operating in the manner set forth.

180. Method of Lighting Gas by Galvanic Electricity; W. W. Hopkins, Amelia, Ohio.

Claim—The arrangement and combination of the hollow permanent magnet, valve chamber, coil, electro-magnetic valve, and tube, as described.

[A gas burner is combined with an electro-magnetic seat in this invention, to control the letting-on and shutting-off the gas; and there is also a certain arrangement of the conducting wires of an electric circuit in which the electro-magnetic valve is placed, by which a piece of platinum constituting a part of the same circuit, and occupying a position over the burner, is caused to be heated by the same action by which the valve is opened, and so ignite the gas.]

181. Harvesters; Moses G. Hubbard, Penn Yan, New York.

Claim—Connecting the cutting apparatus with the machine by an adjustable attachment, which can be changed from a free hinge to a joint, rigid in one direction, or in both directions, for the purposes set forth. Also, the employment of a raising lever of the second order with a gradually increasing purchase, by which it is made self-sustaining. Also, keeping the lever in a convenient position for operation by the hand of a driver, by means of a spring.

182. Elevator for Window Sashes; Wm. Huey, Christiana, Pennsylvania.

Claim—The arrangement and combination of the rods, pawls, ratchets, loose drums, sliding shaft, pins, and cords, as described.

183. Apparatus for Compressing Elastic Fluids; John Jameson, Gateshead, County of Durham, England; patented in England, March 13, 1858.

Claim—The compression and expansion of aeriform fluids by an apparatus of the nature described, the same consisting of a combination and arrangement of a series of cylinders or vessels, perforated or tubular pistons, induction and connecting pipes, valves, a reservoir, a rotary shaft, and means of heating, or heating and cooling, the cylinders or vessels, in the manner described.

184. Tape Primer for Fire Arms; Theodore T. S. Laidley, U. S. Army.

Claim—The combination of two different materials in the manufacture of tape primers, one a metal, or like substance, to receive and protect the percussion powder, into which it can be firmly pressed, and the other to connect the former into a series, something that can be easily severed by the edge of the hammer.

185. Adjustable Sight for Fire Arms; Richard S. Lawrence, Hartford, Connecticut.

Claim—The application of said hinge joint to the spring base and elevator, constructed and arranged as described.

186. Burglar Alarm; G. A. Lilliendahl, City of New York.

Claim—The arrangement of the slide and plate with the lips, so that a cartridge placed on the slide and between the two lips is exploded by pushing the slide in.

187. Railroad Signal Lanterns; S. N. Lennon, Deposit, New York.

Claim—Suspending within the lantern, at two opposite sides. and over or behind the colorless glass plates, the frames, provided with the colored glass plates, and arranged as set forth.

188. Sewing Machines; Clark Marsh, New Milford, Connecticut.

Claim—The ring gauge with the pins, spring, and cam, or their equivalents, constructed and applied in combination with the slide ring, as set forth.

189. Preserve Cans; James F. Martin and Henry C. Nicholson, Mount Washington, Ohio.

Claim—A fruit or provision can, to be hermetically sealed. constructed of metal, lined on the inside with a vitrious enamel, capable of withstanding the action of the acids contained in the fruits, &c , to be preserved. Also, the combination of a metallic cover, vitriously enameled on the inside, with a fruit or provision can.

190. Stoves; David N. Martin, Lawrence, Massachusetts.

Claim—The arrangement of the air register at the upper part of the ascending discharge flue, and with respect to the direct damper, the ascending discharge flue being arranged between the two descending flues of the stove case.

191. Wind-mills; John M. May, Janesville, Wisconsin.

Claim—1st, A standard, arranged in the head of the frame work, and so constructed that it serves as a guide for the central vertical shaft, receptacle for gear, E, or gear, E', or gear, E2, support and axis for the horizontal axle or shaft of the wind-wheel, and as a guide for the sliding thimble. 2d, Furnishing each of the stems of the sails with a cogged segment. for the purpose of revolving the sails on their radial axes, the segments being operated by cogged rack bars attached to the sliding thimble. 3d, The arrangement consisting of the main governor and the forked adjusting rod, connected with each other, for the purpose of operating the thimble in regulating or controlling the wind-wheel. 4th, Providing each of the stems of the sails with a weighted arm projecting forward of the front surface of the sails, for the purpose of governing the velocity of the wind-wheel by regulating the obliquity of the sails to the wind current. 5th, The covering made in two sections, which are constructed and arranged as shown, the tubular section revolving with the wind-wheel independently of section s, when the wind-wheel moves in the path of a vertical circle, and with it when the wind-wheel moves in a path of a horizontal circle.

192. Wind-mills; John M. May, Janesville, Wisconsin.

Claim—1st, The peculiarly constructed stationary, central, vertical shaft, in combination with the peculiarly constructed revolving tubular shaft or hollow column, the shaft providing axes for the wind-wheel, and the tubular column to revolve upon in the paths of horizontal circles, and serving as a support and guide of the structure of the wind-wheel, and the tubular column. serving for receiving the power of the wind-wheel and transmitting it to machinery. 2d, Enlarging the axle at its shoulder in the form of a hub or pipe-box, that the axis of the shaft may pass up directly through it, so that the centre of the axis of the shaft and axle intersect, and in themselves form vertical and horizontal centre bearings within the angle formed by the gear wheels, and the shaft and axle also serve as bearings for the gear wheels. 3d, The combination of a horizontal lever, the vertical governing rod or bar, guide bar, and thimble. on the tubular column. 4th, The employment of a revolving conical cover, for the purposes of protecting the mechanism of the wind-wheel, and dividing the wind current at the front and centre of the wind-wheel head, and guiding it upon the sails, and relieving the weighted elbow levers used for revolving the sails on their radial axis of the countervailing influence of the wind current, so as to enable them to act by centrifugal force with certainty in governing the velocity of the wind-wheel.

193. Cracker Machine; John McCollum, City of New York.

Claim—1st, In combination with the carrying apron, the roller, with its doffer, or the equivalent thereof, and the supporting or feed roller and supporting table, or their substantial equivalents, in the combination the rollers and apron moving with simultaneous, intermittent, progressive motion. the whole being so arranged and operated as to progressively make flat pellets of dough suitable for crackers, ship biscuit, and similar articles, placed in proper order upon the apron, and at suitable distances from each other to permit of the extension of diameter resulting from the operation, as they pass under the roller, without materially disturbing the order of their arrangement on the apron. 2d, The reciprocating docker, in combination with the carrying apron, bed, and stationary perforated clearer plate, and with or without adjustable springs in combination therewith, to make yielding pressure at the docking point. 3d, The flatting apparatus, as set forth in the first claim, when combined with, or used in combination with, a docking apparatus, such as is set forth in the second claim, or the substantial equivalent thereof, when used. combined. and operated for the purpose of docking flatted pellets of dough for crackers as they are progressively brought to and under the docker from the flatting apparatus, without materially disturbing the order of their arrangement on the apron.

194. Dovetailing Machine; W. A. McDonald, Mott Haven, New York.

Claim—The cutter head formed of a screw thread on a cylinder, the screw thread being provided with cutters, and arranged as described.

195. Printing Process; Gordon McKay, Boston, Massachusetts.

Claim—The combination of an impression cylinder and nippers. operating in conjunction with a blast pipe or mechanical means for producing an inequality of atmospheric pressure on the sheet when released by the nippers, and as said sheet is forced onwards by or with the impression cylinder in its rotary movement.

196. Repeating Fire Arm; Henry H. McKinney and Frederic Goth, Biddeford, Maine.

Claim—The combination of two strikers, one trigger, and a mechanism which will not only enable each striker to be set to and maintained at full cock. but by retraction of the trigger, will cause both strikers when at full cock, to be discharged or set free consecutively, so as to be forced against their respective nipples or the percussion caps, or the priming thereon, or the equivalents of such, and cause explosion of the priming of the charges in the order. Also, the specified application of the lock case with respect to the barrel, in combination with the construction and arrangement of the trigger-rod or slider in separate parts, and in such manner as to be capable of being locked together, and of being unlocked or disconnected under circumstances, as specified. Also, the application and arrangement of the two main springs of each striker in the lock case, as explained. Also, the combination of the trigger slide and the lever sears, arranged and operating with respect to the two strikers, as specified.

197. Cruets or Bottles for Castors; J. O. Mead, Philadelphia, Pennsylvania.

Claim—Constructing the cruets or bottles of cruet-stands, so that they may be adapted to each other and to the stand, as set forth.

198. PREVENTING FRICTION ON AXLES; T. S. Minniss and T. S. Minniss, Meadville, Pennsylvania.

Claim—The employment of sectors to avoid friction on rolling or sliding surfaces. Also, the combination of the shaft sectors and their adjusters, arranged as described.

199. WHEELS FOR RAILROAD CARRIAGES; A. R. Morrill, Northfield, Vermont.

Claim—A wheel for railroad purposes, having cast iron hub and rim, and a body of wood formed of double plates, and secured to the hub and rim by bolts, as set forth.

200. RETORTS FOR DISTILLING OILS FROM COAL; John Nicholson, Allegheny, Pennsylvania.

Claim—1st, Furnishing retorts used for extracting the oleaginous matter from coal and other substances with agitators, or a shaft or shafts, armed with agitators, as described. 2d, In so arranging the supply and discharge openings and the exit pipes in connexion with the trunnions, that when one portion of the retort is weakened by the action of the fire, another part may be exposed to it, as described.

201. MACHINE FOR MAKING BULLETS, &c.; Edward Nugent, Brooklyn, New York.

Claim—1st, The revolving self-cutting mould working in contact with the mouth of the lead kettle, through which the cavities are supplied with metal, in the manner set forth. 2d, The end motion of the two series of mould rings, and the opening and closing of the several rings in one series, while the cavities in the other series are being filled. 3d, The tumbling bars, or their equivalents, operating as described, by which a concussion is produced when the mould rings are opened, and allowance is made for any obstruction between the rings when closed.

202. CARPET-SWEEPER; N. B. Pratt, Deep River, Connecticut.

Claim—The arrangement of the rotating brush on adjustable swinging lever bearings, in combination with an elastic driving bolt, as set forth.

203. VULCANIZING CAOUTCHOUC; C. S. Putnam, City of New York.

Claim—The combination of the boiler, the vulcanizing chest, and the condensing chamber, constituting a portable automatic apparatus.

204. HARVESTERS; B. F. Ray, Baltimore, Maryland.

Claim—The conical roller, in combination with the cam groove for actuating the means that operate the cutter bar.

205. WINDLASS; Jesse Reed, Marshfield, Massachusetts.

Claim—The combination of the windlass drums, pawls, with the wheel, and knee or sampson post, whereby the central wheel is supported on both sides, and the windlass rendered more simple and sure in its action.

206. ROCKET MATCH-BOX; A. Roesler and Charles Frey, Warsaw, Illinois.

Claim—1st, The cylinders provided with strips and spring. 2d, The tool with spring, the whole being arranged as described.

207. LOCKS; A. A. Richards, Urbana, Ohio.

Claim—The arrangement of the wheels with their rings, and the spring and slides, for producing friction between them, and the arrangements of the bolts and its stems, and the use of the hands and dial, by which the principle of the above friction wheels and rings is applied to this lock. Also, the arrangement of the eccentric, brake, brake lever, check-bolt, and catch, by which the pressure of the stems on the rings simultaneously with the revolution of the hands and rings is prevented, as described. Further, the manner or arrangement above described, of revolving the dial by removing the screws, L L, as detailed.

208. STEAM ENGINE; Gelston Sanford, Poughkeepsie, New York.

Claim—The inside head, in combination with the cross-head and elongated cylinder, constructed in the manner specified.

209. MODE OF SEALING LETTERS, &c.; Joseph Saxton, Washington City, D. C.

Claim—The process of sealing, by means of fused metals or alloy, whereby the impression is made and the seal secured simultaneously.

210. MACHINE FOR PUNCHING RAILWAY BARS; George Shone, St. Louis, Missouri.

Claim—The arrangement and combination of the recessed gate, triple cam shaft, clamping screws, and adjustable buttons, as described.

[A sliding gate is fitted in a suitable framing, and provided with punches operated by means of cams and yokes; the punches work over a steel bolster, and the gate is recessed to receive the rail. By this arrangement rails can be punched at both sides simultaneously and very expeditiously.]

211. CONVERTING RECIPROCATING INTO ROTARY MOTION; E. A. Smead, Tioga, Pennsylvania.

Claim—The fly-wheel with the adjustable wrist-pin attached, in connexion with the slotted bar or rod, B, and rod, C, the whole being arranged as set forth.

[In this invention, there is an adjustable wrist-pin attached to a fly-wheel, and fitted within a slotted vibrating arm which has a rod pivoted to it at right angles; these parts are so arranged that rotary can be converted into reciprocating motion with the least possible absorption of power by friction.

212. METHOD OF BURNING THE THREADS ON WOODEN SCREWS; T. Briggs Smith, City of New York; patented in England, January 1, 1859.

Claim—The application of a screw made on a bung, and another screw made in the stave corresponding with that upon the bung, both being formed by burning; this bung is to be used for all casks or vessels made of wood for liquids. Also, forming a screw by burning on a bung or stopple, to be used in any vessel made of any material, whether wood, metal, glass, or other material.

213. FLY-TRAP; S. W. Smith, Brooklyn, New York, and Hubbard Bigelow, City of New York.

Claim—1st, The combination of the endless web or apron with the plate or scraper, and the rollers, as described. 2d, The combination of the endless web with the roller and the pan, in the manner described.

214. SEWING MACHINES; Watson Snyder, Newark, New Jersey.

Claim—The combination of the fixed lipper guide for the under edge of the binding, the fixed but adjustable guide for the edge of the folder of the binding, and the elastic plate operated upon by the pressure pad or foot, the whole applied as set forth.

215. DEFECATING AND CLARIFYING SACCHARINE JUICES; John Spangenberg, City of New York.

Claim—The application of hydrated oxide of tin, prepared with sulphurous acid, for the purpose of

decolorizing or bleaching and defecating syrups, saccharine solutions, and liquids from sugar cane, and other saccharine and vegetable juices, whether the same be used alone or in combination with aluminum.

216. CHURN; Oren Stoddard, Busti, New York.

Claim—The combination of the crutch with the interior of the churn-box, so that the lower end of the said crutch shall act as, and constitute the dasher.

217. MOP-HEAD; Luke Taylor, North Springfield, Vermont.

Claim—A mop-head, having a loose collar provided with a screw thread.

218. ICE TONGS; John Tyler, Providence, Rhode Island.

Claim—The combination of a pick and cutter, or either of them, with a pair of ice tongs, by forming or attaching the same upon or to the back of either leg of the tongs.

219. RAILROAD SIGNAL LANTERNS; J. L. Wager, Deposit, New York.

Claim—The lantern case provided with the colorless glass plates, and loosely attached or suspended to the rod or shaft, which is connected with the switch bar or lever; the case being provided with the oscillating or partially rotating frame, containing colored glass plates, and connected with the rod or shaft, by means of the arm, arranged as set forth.

220. CLOTHES FRAME; Lawrence B. Waterman, Chicago, Illinois.

Claim—The combination of the stationary top support with the movable parts. when operated through the segmental racks, and arranged for the purpose of forming a tipping clothes-dryer frame.

221. METHOD OF LOCKING AND SUPPORTING THE PANELS OF FIELD FENCES; Elisha West, Ogden, New York.

Claim—The combination of the panels and the triangular brace or jack, when so arranged in connexion with the recesses of the panels. that by drawing the adjacent panels in opposite directions till the jack shall enter said recesses, the sections of the fence shall be securely locked together.

222. COATING METALS WITH TIN; Carl Winzen, Albany, New York.

Claim—Subject to the explanations and disclaimer, the solution composed of the ingredients in substantially the same proportions applied to accomplish the process of tanning. and used substantially in the manner described.

223. SECURING GARMENTS TO HOOKS; Gilman Woodward and Franklin S. Hathaway, Keene, N. H.

Claim—1st, Securing the hook to the vertical sliding plate, in the manner described. 2d, The manner of operating the arm, in combination with the movement of the hook and sliding plate. 3d, Arming the hook and the arm at their points of contact with movable spurs, in a manner described. 4th, The tumbler, when operated as described, or otherwise to produce the same effect.

224. ELASTIC TOYS; Lucius P. Porter, Assignor to the New York Rubber Co., City of New York.

Claim—The combination of a reed, or other speaking device, with a hollow elastic toy made of caoutchouc or gutta-percha, or their compounds for acting together, the former by the latter. Further, the manner described of securing the reed frame to the toy by grooving the frame on its edges or periphery, and inserting it in a hole in the toy, so as to be clasped in the groove by the edges of the elastic material in which the receiving aperture is made.

225. CORN AND COB MILL; John De Frain, Assignor to Wm. Callahan and Wm. Grant, Philadelphia, Penna.

Claim—1st, Making the hopper of the crusher adjustable on the shell of the same, so as to present to the ear of corn either the corner edge of the hopper or the inner edge of the shell, as occasion may require. 2d, The carrier, the inverted cup, and its adjusting bolt and nut, and arch-piece. in combination with the hopper and spindle, arranged and operating together in the manner described. 3d, The combined arrangement of the scrapers on the bottom of the rotating disk, the annular groove in the diaphragm, and the outlet and tubes, operating together in the manner described. 4th, The combined arrangement consisting of the outlets and the opening through the diaphragm, operating together with the rotary disk, in the manner specified.

226. WASHING MACHINE; Thomas A. Dougdale, Richmond, Assignor to Wm. M. Reed, Newcastle, Indiana.

Claim—Combining and arranging the inclined planes, the plates, and pins, with the double-inverted inclined planes, rollers, and wash-boards, arranged as described.

227. PAILS; Josiah J. Dutcher, Brooklyn, New York, Assignor to Noah Mosher, Norwalk, Connecticut.

Claim—The pail, constructed of the body, A, and jacket, B, of the materials specified, to form a new and useful article of manufacture.

228. SHEET METAL ROOF; Ezra Pollard, Albany, New York, Assignor to self and Joshua Gray, Westfield, Massachusetts.

Claim—1st, Securing the edges of sheet metal coverings of roofs, and other portions of buildings, by means of strips of india rubber, united to the said edges by lap-joints, and nailed to the building. 2d, The interlocking metal strips, formed and applied as set forth.

229. CONVERTING RECTILINEAR INTO ROTARY MOTION; George W. Richardson and Robert Glover, Grayville, Illinois, Assignors to selves and John J. Tanquerry, White County, Indiana.

Claim—The arrangement of the rocking racks, in combination with the segment wheel, as described.

230. ROCKING HORSE; Arad Woodworth, 3d, Boston, and Daniel Woodworth, Warren, and M. T. Hitchcock, Springfield, Massachusetts, Assignors to Arad Woodworth, 3d, and Daniel Woodworth, aforesaid.

Claim—A rocking horse consisting of the head and neck of a horse, made as in the ordinary rocking horse, combined with a hollow box or cradle, so that the child can be placed therein, and which rocks longitudinally, thereby uniting the advantages of a rocking horse and cradle, and preventing the liability of accidents to the child by falling.

MECHANICS, PHYSICS, AND CHEMISTRY.

*On the Manufacture of the Uchatius Cast Steel.**

[Paper read at the Institution of Mechanical Engineers.]

The manufacture of cast steel, of which this paper treats, although not directly in the department of mechanical engineering, is so much connected with it, that a few words on that subject may be interesting to the members of the institution. The quality of the materials used for all parts of machinery and for the tools employed in their construction is of the greatest importance. These materials should possess the greatest strength and tenacity, and at the same time a durable and uniform wearing surface. Now cast steel perhaps beyond all other available metals possesses these qualities, and it is only its great cost that has hitherto prevented its more general application. It has a bearing strength of nearly three times that of the best forged iron, and having a perfectly uniform texture it wears equally; it must therefore be acknowledged that cast steel is the best material that can be used where lightness and strength are required, and for all parts of machinery that are subject to much wear and tear. Its great cost being the difficulty in the way of its extended application, the great object in view for some years past has been to find out some process of making cast steel of a good quality, and at a price that would allow of its free employment. Amongst a great number of metallurgists who have within a very recent period directed their attention to this subject, may be mentioned Bessemer, Chenot, Uchatius, and others. It is intended in this paper to enter only into the details of the Uchatius process of making cast steel, as compared with the ordinary processes at present in extensive use, which are two,—the English or converting process, and the German or puddling process.

To compare these processes with the Uchatius process about to be described, it must first be considered what steel really is, and in what manner it may be produced. This point may be illustrated by the following series, comprising the various degrees of wrought iron, steel, and cast iron, arranged according to the amount of carbon in each, beginning with the softest wrought iron, that is, with the iron containing no carbon, or the least amount of carbon:—

Soft wrought iron,	containing	0·0	per cent.	of carbon.
Hard	"	0·4	"	
Soft steel,	"	0·5	"	
Hard "	"	2·4	"	
Cast iron,	"	2·5	"	
Hard cast iron,	"	5·0	"	

In this series, beginning with the softest wrought iron containing little or no carbon, the proportion of carbon increases until there is $\frac{1}{2}$ per cent., which then forms soft steel; a further increase of carbon up to $2\frac{1}{2}$ per cent. forms cast iron; and the proportion of carbon increasing to 5 per cent. gives the hardest cast iron. Hence it appears that

* From the Lond. Civ. Eng. and Arch. Journal, Jan., 1859.

the operation of steel making may be effected in two methods,—either by adding a certain amount of carbon to pure wrought iron; or conversely by taking away a certain amount of carbon from cast iron, removing at the same time the impurities of the cast iron.

The English or converting process is carried on according to the first of these methods, by adding a certain amount of carbon to wrought iron. The cast iron is first made into wrought iron, which is then converted into steel, forming blister steel; this is broken into small pieces and melted in crucibles, which renders it homogeneous, and is then poured while fluid into ingot moulds, after which it is known as cast steel. The chemical changes which the cast iron has undergone in this process are—firstly, when it was manufactured into wrought-iron all or nearly all the carbon was abstracted from it; and secondly, by the converting process a certain amount of carbon was restored to it; and finally, the steel thus produced was made homogeneous by melting and casting. It is evident that this is a very circuitous way of manufacturing cast steel, and it has the following disadvantages: the great loss of weight in manufacturing the cast iron into wrought, the difficulty in converting the wrought iron so as to carbonize it equally in all parts; the great length of time that this process requires for the production of cast steel, and the great cost of manufacture.

The German or puddling process is effected by the converse method, by taking away a certain amount of carbon from cast iron. The pig iron is puddled in the same way as in making wrought iron, except that the process is stopped when a certain amount of carbon has been taken away, a point which it is difficult to judge of. This partially puddled iron, so-called puddled steel, is then made homogeneous by melting it in crucibles in the ordinary way. The chemical change which the cast iron has undergone by this process is the abstraction of a portion of the carbon in the puddling furnace; and the puddled steel has then been rendered homogeneous by melting and casting. The disadvantages of this method are: the waste of iron by the puddling process; the uncertainty of getting equally discarbonized iron, owing to the difficulty of measuring the quantity of oxygen acting on the puddled metal; and also the cost of manufacture.

The Uchatius process is based upon the same principle as that last described, consisting in taking away as much carbon only as is required to produce steel, and removing at the same time the impurities of the cast iron. The first and most important of these objects is effected by bringing a certain measured quantity of oxygen, in the shape of oxides of iron, in contact with the cast iron, so that while the iron is hot the oxygen combines with the carbon and passes off in the form of carbonic acid gas. The purification of the cast iron from silica, sulphur, magnesia, &c., is effected by bringing the iron when it is in a melted state into contact with the alkaline earths, so that the impurities combine with them and remain floating on the top of the melted metal.

In order to effect these two operations at the same time the pig iron is first melted in a furnace or ordinary foundry cupola, and then run into a cold water tank, where it is reduced into small granules. The

mode in which the granulation is performed is stated to be as follows: the cold water tank has a horizontal wheel placed in it at one end, provided with wooden floats dipping below the surface of the water, and driven at a considerable speed; the melted metal running into the tank from the furnace falls on the wheel, which scatters it in a finely divided state towards the deep end of the tank, and it falls to the bottom in the form of small granules. This granulated cast iron is mixed with pulverized oxide of iron and some alkaline earths, and the whole put into the ordinary steel melting crucibles and placed in the furnaces and brought into a fluid state. The degree of hardness of the steel is thus capable of being regulated by the size of the granules and by the quantity of oxides used.

The chemical change which takes place in the crucible is as follows: Each granule being surrounded by the pulverized oxides, &c., the decarbonization takes place first on the outside of each granule, and so progresses towards the centre as the heat increases, the oxygen in the ores combining with the carbon in the granules and passing off as carbonic acid gas; if therefore during the process the granules could be examined, it would be found that the outside of each is entirely deprived of its carbon, the next portion partially decarbonized, and the centre not decarbonized at all; so that each granule would be composed of pure wrought iron, steel, and cast iron. By increasing the heat, the cast iron centre portion of the granule first becomes fluid, and the granule bursts and falls by its own weight to the bottom of the crucible. At the same time the earths mixed with the ores melt and rise to the top, forming a layer of scoria or dross floating on the surface of the melted iron. Each granule of melted metal has therefore in falling to pass through the rising scoria; and it is in the passing through that the combination of the impurities of the metal with the alkaline earths takes place, so that the decarbonized iron on reaching the bottom of the crucible is cleansed from all impurities. The heat continuing to increase melts the outside portions of the granules, and the whole is reduced to one homogeneous fluid mass in the crucible, which is then ready for being poured into the ingot mould. The iron contained in the oxides mixes at the same time with the fluid mass, and yields about 6 per cent. more of cast steel than the weight of granules put into the crucible.

The oxides employed in this process are iron ores of the finest quality, such as spathose and hematite, which are previously calcined and pulverized. The proportion of the oxide to the granulated iron is according to the hardness of steel required, say from 20 to 30 per cent.; the greater the quantity of the oxide employed, the greater the decarbonization, and consequently the softer will be the steel produced.

The process is attended with the following advantages:—A rapid manufacture of cast steel, the pig iron being turned into cast steel in the space of a few hours; certainty in producing a uniform quality of steel, that is, steel containing a determinate proportion of carbon, which is accurately determined beforehand by the weight of oxide mixed with the granulated iron; and less cost than the ordinary me-

thods of making cast steel, since the processes are fewer and the materials used are simply pig iron and iron ores.

Some experiments in making cast steel by the Uchatius process have been made by the writer at the Newburn Steel Works, near Newcastle-on-Tyne, from which it appears there is little doubt that a very fine quality of cast steel can be produced at a cost little more than one-half of that entailed by the common processes.

A specimen of steel bar was shown made by the process described in the paper, which had been tested and broke with a load of 30 cwt. at the centre, the bar being 1 inch square and 3 feet in length between the bearings; the deflection was 3⅝ inches at the time of breaking. A specimen was also exhibited showing the welding of the two pieces of the steel, and specimens of the granulated iron and the pulverized ore used in the manufacture, and of the bars and plates produced, with some volute springs made from the steel; also a piece of the steel twisted cold to show its toughness.

Mr. T. Spencer said that he had not tested the tensile strength of the steel at present, but found it stood well in the volute springs that had been made of it, which had proved quite satisfactory in working. Only some small plates had been rolled from the steel at present as a trial, but these had proved quite satisfactory; and he did not anticipate any difficulty in making any size required. It would be observed in the specimen exhibited, that the plate was quite sound on the edges, although it had not been rolled edgeways, but simply rolled down lengthways. No wire had yet been made from it; the bars and plates made had been hammered and rolled down from the ingots of cast steel. The total cost of the finished bars was about one-half of that by the ordinary process; but where the makers hammered and rolled their own steel, and the cost of the ingot only had to be compared, the proportion would be considerably less.

Mr. W. Fairbairn thought this process was a very important step in steel manufacture, and would prove of great advantage in the construction of machinery, if a sound uniform steel could be obtained at a moderate price. The bar of the new cast steel that was exhibited certainly showed great strength, having sustained nearly three times as great a weight as iron; and he thought in process of time they might reasonably expect to obtain plates cast and rolled of that manufacture at least double the strength of the present wrought iron boiler plates for the same thickness, and not much more expensive for the same strength; and it had now become a very important desideratum to get plates for boilers only half the thickness at present used, as the thinner plates were so much less liable to injury from overheating and unsoundness in manufacture.

Mr. T. S. Prideaux thought the dropping of the melted iron into water in the process of ganulating it would have a beneficial effect in assisting to free the metal from sulphur, by the metal coming in contact with water in a red hot state; the plan had been tried in Austria, he believed, with success. It was not at all easy to separate sul-

phur from iron by simple exposure to oxygen in atmospheric air; and he thought the plunging of the highly-heated granules in water would be the means of removing the sulphur to a considerable extent from the iron.

Mr. W. Smith thought the process that had been tried in Austria was that of Capt. Uchatius now described; the plan of granulation seemed a very ingenious and important step towards obtaining steel by the direct process of decarbonizing, and offered the best chance of carrying that process to a successful and economical result. Great advances were being made at the present time in steel manufacture, and they were doubtless greatly indebted for these advances to the investigation of the subject that had been excited by the publication of Mr. Bessemer's plans, although he had not succeeded in all that he had attempted himself; and they were also much indebted to Mr. Binks for having called more minute attention to the chemical principles involved in the manufacture of steel. The new process described in the paper appeared to have effected a great success in obtaining cast steel by the direct process; and if the uniformity of quality could be maintained, the economy of manufacture would allow of the use of cast steel being extended to many important new applications, such as boiler plates, and steel wire for the manufacture of telegraph cables.

Mr. A. Lenz explained respecting the process, in the absence of Capt. Uchatius, that the only object in dropping the melted iron into water was to effect its granulation, and not for the purpose of depriving it of sulphur. The process of this manufacture of steel was to decarbonize the cast iron by the action of oxides under a high temperature, the great object being to expose the largest possible surface of the iron to this action, and by granulation this object was obtained to a remarkable extent. As to the actual composition of the steel, Capt. Uchatius had come to the conclusion, from the results of his observations, that the best steel required some small portion of what are considered impurities, such as sulphur, silica, &c.; and that chemically pure steel was not the result to be aimed at, and he had found that even with $\frac{1}{4}$ per cent. of sulphur the steel was of good quality. The great desideratum was to make steel at a very cheap price; and he had hopes it might even be practicable to apply it ultimately to the manufacture of railway bars.

Mr. J. Anderson observed that the first steps had certainly been accomplished towards obtaining a better material at a reduced cost, and this was a very important object to be aimed at. Mr. Binks had been the first to draw attention to the fact of steel containing nitrogen, which from his researches appeared to be an ingredient of great importance in the composition of the different qualities of steel, and he was not aware whether any further information had been obtained upon this point.

Mr. E. A. Cowper remarked that, in the list of compounds of carbon and iron given in the paper, the hard cast iron was put down as having the largest proportion of carbon; but he supposed it was not meant that the hardest cast iron was that containing the most carbon,

as the extreme of soft grey iron was kishy from an excess of carbon. He asked whether the Uchatius process removed the phosphorus from the iron; and what were the results of Chenot's process, by which a spongy mass of iron was produced, which was then compressed and dipped into oil, converted and worked into bars.

Mr. A. Lenz said that only the good qualities of iron were attempted to be used for steel-making by the Uchatius process, and the Indian and Swedish iron was principally used, containing very little trace of phosphorus, as it was doubtful whether any phosphorus could be removed in the process.

In Chenot's process the principle was to employ pure magnetic iron ore in powder, which was found in a few situations in the Pyrenees in a natural state of powder, and was separated by a machine from the earths mixed with it. This powder was put into a furnace like a cupola, within a tube in the centre protecting the ore from the fuel, and exposed to a great heat; the powder then became in a spongy state, by reduction to nearly pure iron, but was not able to melt. It was then compressed cold with great force under a hydraulic press to solidify the mass, and was finally carbonized by covering the mixtures of oils and other carbonaceous substances, and melted in a close crucible. He doubted the process being adapted for the actual manufacture of steel on any large scale, and thought it more suitable for the laboratory than the shop; various articles have been made of the steel for trial, which he believed were of a good quality, although he thought there was not any regular manufacture carried on.

Mr. W. Fairbairn had seen the process in operation two years since in Paris, and the steel that was manufactured by that means was of good quality; but the process was carried out only on a small scale, and seemed scarcely suitable for any wholesale manufacture.

Mr. T. Spencer observed that a magnetic machine was employed to separate the iron from the earthy matter, when in the state of powder as found naturally. The pig iron was broken into 6 or 8 inch pieces, and was at first put into the cupola for melting in the ordinary way; but they had now constructed a furnace for the purpose, as the ordinary cupola rather increased the proportion of sulphur in the metal by absorbing some from the fuel; the new furnace was a kind of reverberatory furnace, melting the iron in a chamber separate from the fire. The fluid metal was then run into the granulating tank; and the granules of iron were collected at the bottom of the tank by drawing off the water.

De-odorizing Alcohol.

In trying to prepare a transparent soap, M. Kletzinsky has made a curious observation which may be of value in the arts; he found that empyreumatic alcohols distilled over properly selected soaps lost their bad odor and their bad taste. A series of experiments resulting from this first observation lead to the following results:—

1. Spirits of wine, brandy, or alcohol distilled over soap lose their

empyreumatic odors and tastes entirely. About 212° the soap retains neither alcohol nor wood-spirit.

2. The empyreumatic oil which remains in combination with the soap which forms the residuum of the distillation, is carried off at a higher temperature by the vapor of water which is formed during a second distillation, the product of which is a soap free from empyreuma and fit to be used again for similar purposes.

3. The concentration of the alcohol increases in this operation more than when soap is not employed, because this compound retains the water, and the alcoholic vapors which pass over are richer.

4. 33 lbs. of soap is enough for 100 gallons of empyreumatic brandy, and direct experiments have shown that under the most favorable circumstances, the soap can retain 20 per cent. of empyreumatic oil.

5. The soap employed should contain no potassa; it must be a hard or soda-soap, and ought to be completely free from any excess of fat-acids or fluids, otherwise it may render the product rancid and impure. Common soap made with oleine and soda by the manufacturers of stearine-candles has satisfied all the conditions in practice. If this soap is employed, it will be better to add a little soda during the first distillation.

The hard soda-soaps, as exempt as possible from fluid fat-acids, remove completely the empyreumatic odor, and act, for equal weights, much better than any of the other modes heretofore proposed, which disguise rather than correct the fault.

For the Journal of the Franklin Institute.

METALLURGICAL NOTES, NUMBER I.

Manufacture of the Oxide of Zinc near Lancaster, Pennsylvania.

By W. J. Taylor.

The occurrence of sulphate of zinc in the oxide of zinc of commerce, such as is used as a paint, has not, to my knowledge, ever been noticed. It may not be uninteresting to metallurgists and chemists to mention such occurrence; the quantity of sulphuric acid found by analysis in the oxide of zinc, the process used in the manufacture, and the ore from which it was obtained; also, to mention some of the objectionable properties which were attributed to the presence of the sulphuric acid.

The article in question was made at *temporary* works for the manufacture of zinc oxide near Lancaster, Pennsylvania; temporary works as being evidently designed by the originators of the company (which was organized for the purpose of mining the ore and manufacturing the oxide,) to last only until a favorable opportunity would offer to enable them to sell their stock.

It will first be necessary to describe the ore of the mine, and to do this properly it will be advisable to mention a little about the mine and its geological position. The ore occurs in a blue magnesian lime-

stone of the lower silurian system; there appeared to be two layers of the zinc ores, which were divided by a layer of the dolomite; but this was most probably only an appearance, as the layers evidently united at a comparatively slight depth. The deposit is situated in a valley and dipped north at an angle of thirty-two degrees; between the dolomite and the lower layer of zinc ore, was a seam of galena from two to three inches in thickness, which frequently diminished to a mere thread. Carefully selected specimens of this galena contained about an ounce of silver to the ton (2000 pounds). On this slight appearance, the mine was formerly worked as a lead mine. The mass of the zinc ore of both layers was blende, which was mixed intimately through the dolomite in a way peculiar to this locality. The zinc blende had decomposed near the surface and a carbonate of zinc resulted, with very small portions of electric calamine (silicate of zinc). The mine being in a valley, water was reached at a short distance, and below this, the ore was entirely the sulphuret of zinc.

It was advised before erecting the works to explore the locality more fully, in order to find whether more of the carbonate existed, but such advice was disregarded, and metallurgical works were erected.

The carbonate which had previously been extracted in the explorations for the lead, was first used in the furnaces, and a superior quality of oxide of zinc was made from it; but this ore was soon exhausted, (there never was more than about two hundred tons of the carbonate of zinc taken from the mine,) and as a last resort, the zinc blende was used. It was surmised that from the peculiar mechanical mixture of the blende with the magnesian limestone, that at a high heat a double decomposition might result; oxide of zinc being formed, and the sulphurous vapors uniting with the lime and magnesia form sulphurets of calcium and magnesium, which would remain with the slag.

This very pretty theory unfortunately was not entirely verified by actual experiments. Large quantities of sulphurous acid gas was evolved, and in addition, sulphuric acid was formed, which united with the oxide of zinc. The sulphate of zinc resulting, though in small quantities in the oxide, prevented this latter from being ground with oil, advantageously, so that the manufactured article, which, from its appearance and the known quality of the oxide manufactured from the pure carbonate was readily sold by sample, after trial was returned as useless for the purposes of grinding in oil as a pigment, the complaint principally was that it was too great an absorbent.

No. 1 contained—

Sulphuret of zinc,	45·34	per cent.
Carbonate of lime,	26·80	"
Carbonate of magnesia,	14·88	"
Carbonate of iron,	5·04	"
Silica,	5·43	"
Water and loss,	2·51	"
	100·00	

[45·34 per cent. of sulphuret of zinc yields 36·73 per cent. of oxide of zinc.]

This ore, as will be at once seen from the above analysis, was zinc blende mechanically mixed with magnesian limestone. At the closing operations at this mine and at the lowest of the workings, an average sample gave on analysis not more than 8 per cent. of the oxide of zinc.

No. 2 contained—

Carbonate of zinc,	78·70	per cent.
Carbonate of lime,	12·64	"
Carbonate of magnesia,	2·62	"
Sesqui-oxide of iron,	2·32	"
Silica,	2·36	"
Water and loss,	1·36	"
	100·00	

[78·70 per cent. of carbonate of zinc yields 51·00 per cent. of oxide of zinc.]

This ore, as has been mentioned, was the result of the decomposition of the blende, above water level and to the depth at which atmospheric agencies had penetrated.

No. 3.—Is the result of analysis of a sample of the oxide of zinc manufactured from zinc blende composition shown by No. 1.

Oxide of zinc,	78·07	per cent.
Sulphuric acid,	4·60	"
Water,	15·00	"
Sulphate of lead and quartz,	2·77	"
	100·44	

As there has been but little published regarding the processes used in the United States for the manufacture of the oxide of zinc, a little sketch may not here be uninteresting.

The process used at the Lancaster works was generally the same as that used at the Lehigh works; indeed, there is but little difference even in the works at Bergen Hill and at Newark, New Jersey; with the exception that at the two latter named places, a variety of reverberatory furnace was used in place of the superior one patented by Samuel Wetherill, Esq., of Bethlehem, Pennsylvania; though I believe Mr. Wetherill's furnace is now used at Bergen Hill works.

The Wetherill furnace consists of a semi-circular arch of fire-brick turned over a hearth of perforated grate bars, with a tight ash-pit beneath, into which a steady blast is blown, which diffuses itself beneath the entire fire surface through the perforations in the bars, which are filled with holes not greater than a quarter of an inch in diameter.

These grate bars are about two feet long by about five or six inches in width; two lengths being the width of one furnace. The perforations are conical, being the smallest at the top. The front of the furnace is closed excepting a door-way about eighteen inches square. The oxide of zinc volatilized, passes through openings in the top of the furnace arch, which connect by short iron vertical pipes with a large horizontal conducting pipe, which serve for a "bank" of furnaces; for the furnaces are built in banks of a dozen or more. A strong draft caused by a large fan blower draws the oxide as it is volatilized from

the furnaces through this same blower, which forces it into brick buildings or houses, where it passes in at the bottom and out at the top, and by this passage deposits the heavier particles of ashes or little impurities which the draft carried from the furnaces; the vapor passes out the top of this brick building into another built a short distance from it filled with immense muslin sacks, through which the vapor of zinc is filtered, the cotton fabric prevents the passage of the oxide of zinc, but does not hinder in the least degree the escape of the coal gas. These cotton bags require to be shaken constantly during the day, the pores of the muslin becoming so coated with the oxide of zinc as to prevent the escape of the coal gas. They are generally arranged with vertical appendages, into which the oxide falls, and is removed from time to time. These muslin filters were invented by Mr. Richard Jones, of New Jersey, several years since.

The furnaces are charged with the pulverized ore, mixed with about 33 per cent. of fine coal, a fire being started on the grate bars before the charge is added.

Artificial India Rubber.

We take from the Proceedings of the Academy of Sciences of Paris, the two following communications, in the hope that they may prove useful in our arts:—

On the Action of Chloride of Sulphur upon Oils. By M. Z. Roussin.

If a vegetable oil be mixed with about $\frac{1}{30}$ of its bulk of chloride of sulphur, this latter substance will be entirely dissolved; in a little while the mixture heats and assumes a viscous consistence, so that frequently the vessel may be inverted without spilling the contents.

If the chloride of sulphur is in the proportion of $\frac{1}{10}$, the preceding phenomena acquire greater intensity. The mixture soon attains a temperature of 120° or 140° Fah., some bubbles of hydrochloric acid are disengaged, and the whole mass solidifies instantaneously without losing its transparency, and acquires a consistence like caoutchouc. This product possesses some elasticity and shrinks slightly after consolidation. Macerated in distilled water it loses its transparency and becomes opaque white. In a few days it is transformed into a white, slightly friable, elastic mass, having no similarity to the original substance, and resembling rather an organic substance.

If we take a mixture of one part of chloride of sulphur, and nine of oil, and heat the mixture, we shall find that at about 140° a pretty strong re-action shows itself. Hydrochloric acid is disengaged, and the mass is transformed into an elastic cavernous substance like sponge, very closely resembling certain cryptogamic vegetations. Macerated in water, it becomes whiter without changing its form.

All these products resist the action of boiling alkalies, whether dilute or concentrated. Ammonia and the concentrated acids have no action on them. Neither water, alcohol, ether, sulphuret of carbon, or the oils appear to alter or dissolve them.

At the temperature of 300° Fah. they remain solid and unaltered. A few degrees above this point they begin to melt into a brown liquid and emit whitish acid vapors. We have not had time to determine the composition of these substances. After long boiling in alkaline solutions, reiterated washings with dilute acid and boiling water, they still contain sulphur and chlorine in considerable quantities. In this state, the slightest shaking communicates to them a peculiar vermicular motion, which continues for some time.

Action of Chloride of Sulphur on Oils or Vulcanization of Oils.
By M. Perra.

The chloride of sulphur combines at ordinary temperatures with flaxseed oil as well as with other oils.

If we take 100 parts of flaxseed oil and about 25 parts of chloride of sulphur, we obtain a compound which has the maximum hardness.

100 parts of the oil and from 15 to 20 of the chloride give a flexible compound.

From 5 to 10 parts of the chloride will thicken 100 parts of the oil very strongly without hardening it. In this state it is soluble in all the solvents of common oils. This is not the case with the other combinations, which swell somewhat, and lose a little sulphur without dissolving in solvents.

If we dilute a given weight of flaxseed oil with 30 or 40 times its weight of sulphuret of carbon, and introduce one-fourth of the weight of the oil of chloride of sulphur, we have a product which will remain liquid for some days. If in this condition it be applied upon glass or wood, &c., the sulphuret of carbon evaporates and you have instantly a varnish.

The chloride of sulphur saturated with sulphur is preferable for these actions, to that which is not saturated.

In making these mixtures, proceed as follows:—Introduce the chloride of sulphur quickly into the oil, which must be stirred so as to mix them intimately. Gradually the mass heats, the combination takes place, the oil thickens, and forms a compound more or less soft according to the proportions of the chloride. But small quantities should be operated on at a time, and all elevation of temperature must be avoided, otherwise the chloride of sulphur will be volatilized, and will form bubbles in the mass, or carbonize and blacken the oil. As soon as these two substances are intimately mixed, pour the mixture on a plate of glass or other polished substance, smooth it, and in five or six minutes, according to the temperature of the air, you obtain the compound. With the point of a knife detach one of the corners of this pellicle, which may easily be raised without breaking. One coat may be laid over another, and they will unite in one, provided the upper one be put on after the temperature of the lower has been reduced; moisture in the air must also be avoided, which decomposes the chloride and prevents the adherence.

By following this mode, I have succeeded in making little boxes, knife-handles, &c. By introducing wire gauze into the mixture, plates of considerable resistance may be procured. This is easily done by laying the wire gauze on the glass and proceeding as above.

All the products thus made, are completely transparent, if care be taken to keep the articles in a stove or other warm place to drive out the vapors of chloride of sulphur, and prevent the dampness from decomposing this compound. These hard compounds of oil are not attacked by any atmospheric influences; I have left them for several years exposed to the external air.

These compounds are not, like vulcanized india rubber, flexible when cold, but are brittle when handled carelessly, which is an inconvenience. A still greater one is the decided smell which they retain for a long time.

I have tried to make them as hard as hardened india rubber, but in vain. Almost all substances introduced into them are altered by the chloride, and add nothing to the hardness.

They can, however, easily be colored. It requires but a little color mixed with the oil before the introduction of the chloride. Some colors, however, are altered by it.

These compounds resist very well the mineral acids and alkalies when moderately dilute. These alkalies concentrated saponify them finally. A heat of 250° browns them, a higher temperature melts them with a blackish color. This vulcanized oil may be well used for moulds, as it takes impressions very sharply. When rubbed, it always keeps a smooth and polished surface. It has electric properties in a high degree, and might be used for plates for electric-machines.

I have not been able to apply this substance upon stuffs, in consequence of its acid reaction, which destroys them. I have plated wood with it, by first roughening the wood so as to cause it to adhere. It may be applied for floor-cloths, table-covers, imitation marbles, window panes, &c.

I will remark, in conclusion, that the bromide of sulphur has the same properties as the chloride, and it was, in fact, with the former that I made my first experiments at the College of France, in 1853.

For the Journal of the Franklin Institute.

Use of Carbon for Dusting Moulds for Casting Metals.

By W. J. Taylor.

In the February number of the *Journal of the Franklin Institute*, is a notice of a recent English patent for the dusting or coating the inside of sand moulds for iron castings, with pulverized carbon which is free from bituminous matter. This may possibly be new in old England, and doubtless is considered by the worthy officials of the circumlocution office as requiring special protection; the process is, however, quite an old one in the United States, and is here so universally known

that it will not be possible to find a furnace or foundry in the country where pulverized charcoal or anthracite is not used or has not been in use. I believe that in some foundries a chemical compound is now used, one of the principal components of which is probably carbon.

New Dividing Engine. By M. Froment.

M. Froment requested from the Academy of Sciences of Paris, an examination by a committee of his mode of dividing astronomical instruments. This mode is not of recent invention, but has been in daily use by M. Froment for a long time, and has been shown to many of the members of the Academy. Respect for the memory of the late M. Gambey, and a fear of injuring the interests of the heirs of this illustrious mechanic, have alone retarded the official presentation of this process of incomparable exactness. After, however, the presentation by M. Guillemot of means for the same end, M. Froment feels that he has the right to take public possession of his own discovery.

The processes employed for the division of circles and of straight lines are analogous; let us therefore suppose that we are describing one of the latter kind, the principal organ of which is a screw with a thread of 1 mm. (0·04 inch).

Upon the chariot which carries the tracer is placed a metallic rule, on which are traced two fine lines, the arbitrary distance of which apart (d) must remain the same during each experiment.

The chariot being brought to its starting point, a microscope upon the table of the machine is brought exactly over one of the marks, and the number of turns and fractions of a turn (n) of the screw noted, which are required to bring the second line under it; that is, to advance the chariot through the space d.

The microscope is then moved to correspond again with the front line; and the observation repeated again and again until the chariot has advanced the whole length of the screw; and thus the number of turns corresponding to an equal length at different parts of the screw is determined. These differences may be read either upon the head of the screw, or on a filar micrometer in the microscope, or by means of a comparing lever, &c.

By repeating these operations with properly chosen values of d, we get to know the condition of the screw at all its points.

Upon a band of metal a curve is then traced, whose abscissas represent the successive quantities by which the chariot must advance when dividing; and whose ordinates have lengths proportional to the variations of the screw thread determined as shown above; and as these variations are ordinarily small fractions of a millimetre, they are represented by ordinates some hundreds of times larger.

The band of metal is then cut out along the profile of the curve, and adjusted in a groove so as to move with the dividing chariot.

A little roller whose centre is restricted to move in the plane of the

curve, and perpendicularly to the abscissas, rests on the curve. As the curve advances it obliges this roller to rise or fall according to the ordinates which it meets, that is, proportionally to the errors to be corrected; but with a motion much greater than the errors, an important point in the method, since it permits us to neglect certain inaccuracies in the execution of the curve and of the pieces moved by it.

Then by reducing the motion of the roller by means of levers or their equivalents, we easily communicate to the tracer a motion equal and in a contrary direction to the errors of the screw at different points of its length, and consequently we divide by the machine as if the screw was perfectly uniform.

In place of communicating to the tracer the slight displacement which we have explained, we might apply it equally well to the screw itself, by acting on the piece against which the screw rests.

A third means of correction consists in communicating the motion of the roller to the system of stops generally employed to limit the angle through which the screw turns at each division traced by the machine; this angle being thus increased or diminished at each instant by quantities corresponding to the irregularities of the thread, it will result that the nut and the attached chariot will move regularly.

The same means are applied in a similar way to the machines for dividing circumferences, which generally consist of a circular platform whose circumference is toothed and moved by an endless screw.

To determine the errors, an arbitrary arc is taken, whose extremities are marked by fine lines, which are brought successively under the microscope which is displaced around the circumference, so as to engage the screw in different parts of the rack. The curve is traced by polar co-ordinates upon a disc which has the same angular motion as the principal platform, and the roller is moved by either of the methods mentioned above. These three methods employed for several years upon different machines, have given equally satisfactory results.

To complete the above explanation, I would add, that instead of seeking to determine at once in great detail, the errors of the machine, for the purpose of applying definitive corrections, it is better to begin by an approximate determination, which gives a provisional curve and produces a considerable amelioration in the machine. By a new study of it in this state, we are led to corrections of the second order, which may be followed by those of a third; but in almost every case, the second are sufficient to attain the limits of accuracy belonging to the kind of correction which we are considering.

Remarks.—We understand that the machine used by Messrs. Darling & Schwartz, of Bangor, Maine, for dividing the rules to which first premiums have been awarded at two successive Exhibitions of the Franklin Institute, combines the same leading idea, as the very ingenious machine here described by M. Froment. *Ed. Jour. Fr. Inst.*

Copying Drawings by Galvanism.

Marshal Vaillant described to the Academy of Sciences of Paris a mode of copying drawings devised by M. Defrance, and perfected by Colonel Levret. The process is as follows:—

The drawing is made on transparent paper, and is laid, face downward, upon a board, and fixed by tacks. Coats of gelatine are then applied with a brush to the back of the drawing so as to obtain a sheet of gelatine from $\frac{1}{100}$ to $\frac{1}{50}$ inch thick. Upon this gelatine the drawing is traced with a simple point. A solution of gutta-percha in sulphuret of carbon is then applied with a pencil, and the coatings repeated until it has also assumed a thickness of about $\frac{1}{100}$ of an inch. This will require at least thirty coats. When the gutta-percha is sufficiently dry, a plate of copper is laid on it to give it stiffness. The whole is then turned up, and the original drawing exposed. This is easily removed, and then by delicate touches of a sponge dipped in water, the gelatine is separated from the gutta-percha, which is metalized by black lead. The plate is then electrotyped as usual.

The Marshal, (who is Minister of War,) declares that by applying this process to the six-sheet map of Kabylie, they have obtained an economy of seven-eighths of the time, and of six-sevenths of the expense.

Acad. of Sciences of Paris, Nov. 19, 1858.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, March 17, 1859.

John C. Cresson, President, in the chair.

John Agnew, Vice President, } Present.
I. B. Garrigues, Recording Secretary, }

The minutes of the last meeting were read and approved.

Donations to the Library were received from Prof. A. D. Bache, Washington, D. C.; the Board of Water Commissioners, Detroit, Michigan; Young Men's Mercantile Library Association, Cincinnati, Ohio; Prof. Joseph Lovering, Cambridge, Mass; Cornelius A. Walborn, Pennsylvania Legislature; and Dr. T. S. Kirkbride, Professors John F. Frazer, John C. Cresson, and B. Howard Rand, H. P. M. Birkinbine, Esq., John E. Addicks, Esq., and Philip Price, Esq., Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement for February, was read.

The Board of Managers and Standing Committees reported their minutes.

The Board of Managers reported that they had organized for the present year by electing Robert Cornelius, Chairman, and Messrs.

Isaac S. Williams and James H. Bryson, Curators, and appointed the following Standing Committees:

On Publications.	*On Instruction.*	*Managers Sinking Fund and Finance.*
John C. Cresson,	John F. Frazer,	Frederick Fraley,
B. H. Bartol,	Frederick Fraley,	Samuel V. Merrick,
J. V. Merrick,	Isaac B. Garrigues,	Evans Rogers,
Fairman Rogers,	Alan Wood,	John F. Frazer,
Washington Jones,	George Erety,	Joseph Harrison,
	Lawrence Johnson,	George Erety.

The stated meetings to be held on the second Wednesday evening of each month.

The Actuary reported that the following Standing Committees have organized by electing their chairman, and appointing their times of meeting:

Committees.	*Chairman.*	*Meetings.*
On the Library,	Henry K. Plumley,	1st Tuesday evening.
" Exhibitions,	John E. Addicks,	1st Thursday afternoon.
" Arts and Manufactures,	David M. Hogan,	1st Friday evening.
" Minerals,	John C. Trautwine,	2d Monday "
" Science and the Arts,	John C. Cresson,	2d Thursday "
" Meetings,	Washington Jones,	Monday previous to 3d Thursday.

Candidates for membership in the Institute (3) were proposed, and the candidate proposed at the last meeting (1) was duly elected.

Dr. Rand exhibited two stereoscopic photographs on glass of the surface of the moon, taken by Mr. L. M. Rutherford of New York; also, a number of single pictures on paper of the same; also, a series of large photographs of the experimental steamer built by Messrs. Winans of Baltimore.

Dr. Rand exhibited a new design for valve gear, by S. L. Wiegand. It has been submitted to the Committee on Science and Art for an examination and report, which when made may be found in the proceedings of that Committee.

Mr. D. R. Pratt exhibited and explained the model of an electro-magnetic burglar, fire, and house alarm, invented and patented by Mr. William Whiting of Roxbury, Mass. It consists of a series of electro-magnetic circuits leading from the various parts of the building to be protected, through an indicator to an alarm apparatus, which is put in operation by breaking the connexion of any of the circuits, which is done by opening the doors, windows, or other means of access to the places guarded. A very ingenious arrangement is also provided for indicating the presence of fire by a sensitive metallic coil, which, by its expansion, will break the circuit. The special circuit broken is shown by the indicator; which with the alarm apparatus can be put up in any convenient place for observation. Mr. Pratt stated that the apparatus had been in practical operation for several months and had proved satisfactory.

Mr. A. N. Macpherson exhibited the model of a paddle-wheel for steamboats, invented by Mr. William Golding of Philadelphia. The model illustrated two very ingenious plans for feathering the paddles;

one by ratchets operating on a cog-wheel attached to the shaft; the other by an eccentric also placed on the shaft.

W. Jones submitted the register for warming and ventilating apartments, invented by Joseph Leeds. It consists of the usual openwork plate with a flat valve swinging on pivots set in a horizontal line. When the lower edge of the valve is brought forward against the openwork plate, the communication between the heat flue and the apartment is closed, while that between the apartment and the ventilating flue is opened. When the position of the valve is reversed, the heat is admitted and the ventilator closed. Should the apartment have the proper temperature, the valve is placed vertically, when the heat passes directly up the ventilating flue back of the valve. The Committee on Science and Art have had this register under consideration, and their report will no doubt appear in the pages of the *Journal.*

Mr. Agnew laid upon the table some scale detached from a boiler by the use of a chemical compound for cleaning boilers, &c., by Chester, Clark & Co., Practical Engineers, Allentown, Lehigh County, Pennsylvania, which appears to be useful in removing that troublesome complaint arising from the use of limestone water.

Mr. H. Howson presented some specimens of burnt cast iron recovered by the use of graphite, as applied by Messrs. Morris & Quain. No. 1 was made from old retorts melted with the graphite in the proportion of three of the former to one of the latter. Nos. 2 and 3 were specimens of wrought iron made from cast iron so melted. Extensive beds of this graphite are found in the neighboring counties of Chester and Lancaster.

BIBLIOGRAPHICAL NOTICE.

Engineering Precedents for Steam Machinery; Embracing the Performances of Steamships, Experiments with Propelling Instruments, Condensers, Boilers, &c., accompanied by Analyses of the same; the whole being original matter and arranged in the most practical and useful manner for Engineers. By B. F. ISHERWOOD, Chief Engineer, U. S. Navy; New York. H. Bailliere, 1859.

We have received the first volume of a series having the above title. It contains descriptions of the build, and accounts of the performances, with comparisons of a number of British Government steam vessels, constructed for littoral warfare by the best English makers; and the results of the trials with H. B. M. ship "*Conflict*," propelled with screws of various kinds; as well as a comparison of the effect obtained during the test trials of the U. S. Steamers "*McLane*" and "*Spencer*" to determine the relative efficiency of the paddle-wheel and screw propeller. The present volume is a valuable contribution to the library of the marine engineer; and if (as hoped,) the author will continue his labors, and publish the data and results of his experiments and his observations in the other branches of engineering practice, they must prove acceptable to the profession at large. J.

Abstract of Meteorological Observations for January, 1859*; made in Philadelphia and Somerset Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.*

PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.

SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.

1859.	Philadelphia: Barometer, at 32° F.					Thermometer.						Rela-tive humi-dity.	Force of vapor.	Rain and Snow.	Pre-vail'g winds.	Somerset: Barometer.		Ther.		Rela-tive humi-dity.	Force of vapor.	Rain and Snow.	Pre-vail'g winds.
Jan.	7 A. M.	2 P. M.	9 P. M.	Mean.	Mean daily range.	7 A. M.	2 P. M.	9 P. M.	Mean.	Daily oscil-lation.	Mean daily range.	2 P. M.	2 P.M.			Mean.	Mean daily range.	Mean.	Mean daily range.	2 P. M.	2 P.M.		
	Inch.	Inch.	Inch.	Inch.	Inch.	°	°	°	°	°	°	Per ct.	Inch.	Inches.	Direc.	Inch.	Inch.	°	°	Per ct.	Inch.	Inch.	Direc.
1	29·666	29·715	29·929	29·770	·141	37½	42	38	39·2	8	1·8	74	·199	0·158	W N W	27·581	·132	31·7	3·0	71	·139		W N W
2	30·141	30·113	30·170	30·141	·371	31	39	33	34·3	10	4·8	55	·130		N W.	27·786	·205	28·0	7.3	77	·179		W.
3	30·168	30·075	30·065	30·099	·060	31	35	30	32 0	7	2·3	75	·152	0·317	N E.	27·742	·051	28·7	5·7	79	·155		S
● 4	29·792	29·795	29·895	29·827	·272	29½	34	35	32·8	10	2·5	79	·155		N W.	27·611	·136	27·3	3·3	95	·168	0·076	W N W
5	30·047	30·015	30·019	30·027	·200	27	37	32	32·0	11	2·8	62	·136		S W.	27·680	·094	31·0	7·7	90	·207		S W.
6	30·058	30·055	30·010	30·041	·020	32	43	40	38·3	15	6·3	67	·186		S W.	27·679	·049	37·3	6·3	68	·195	0·278	S S E.
7	29·674	29·439	29·387	29·500	·541	41½	47	42½	43·7	10	5·3	96	·311	1·209	(var.)	27·255	·425	38·7	10·0	92	·311	0·140	W S W.
8	29 719	29·821	30·029	29·856	·356	26	25	15½	22·2	12	21·5	50	·067		W.	27·562	·307	6·0	32·7	80	·051		W.
9	30·024	30·006	30·066	30·032	·176	14	22	19	18·3	10	6·2	45	·053		(var.)	27·639	·077	11·0	5·7	54	·056		W.
10	30·319	30·372	30·413	30·371	·336	0	4	2	2 0	7	16·3	73	·038		N W.	27 904	·265	3·0	8·0	35	·023		N W.
11	30·274	30·072	29·962	30·103	·262	2½	16	17½	12·0	18	10·0	66	·059		W	27·623	·280	34·7	31·7	66	·177		W S W.
☽ 12	29·975	29·896	29·924	29·932	·171	21½	32	31	28·2	17	16·2	79	·143		S W.	27·639	·068	37·0	6·3	80	·170		W.
13	29·906	29·859	29·885	29·883	·048	21½	50	43	38·2	26	10-0	51	·185		S W.	27·644	·019	40·7	4·3	70	·236	0·203	W.
14	29·783	29·614	29·560	29·652	·231	38	40	38	38·7	5	10·5	82	·203	0·238	N E.	27·337	·306	45·0	4·3	100	·335		S.
15	29 452	29·407	29·506	29·455	·197	38½	49	42	43·2	13	4.5	92	·323		S W.	27·207	·147	32·7	12·3	84	162	0·075	W.
16	29·766	29 886	29·935	29·862	·407	36	44	35	38·3	11	4·8	45	·129		W.	27·585	·378	30 7	3·3	90	·183		W S W.
17	29·863	29 838	29·962	29·888	·057	36	49	35	40·0	16	1·7	44	·152		(var.)	27·678	·093	29·3	4·7	78	·140	0·058	(var.)
○ 18	30·231	30·255	30·218	30·235	·347	29	35	29½	31·2	8	8·8	35	·072		N W.	27·959	·281	23·0	6·3	88	·147		(var.)
19	30 197	30·129	30 137	30·155	·080	28½	47	37	37·5	22	6·7	41	·133		S W.	27·871	·084	35·0	12·0	67	·186		S W.
20	30·155	30·038	30·023	30 072	·082	34	53	48	45·0	21	7·5	60	·244		S W.	27·712	·163	43·3	8·3	67	·282		S W.
21	29·823	29·659	29·744	29·742	·330	54½	50	41½	48·7	13	10·0	93	·335	1·389	(var.)	27·549	·163	34·7	13·3	100	·229	0·534	(var.)
22	29·892	29·873	30·117	29 961	·219	37	43	27½	35·8	17	12·8	59	·163		(var.)	27·720	·173	15·0	19·7	78	·095	0·073	W N W
23	30·282	30·349	30·412	30·348	·387	16½	23½	20	20·0	9	15·8	67	·084		N W.	28 001	·281	5·3	9·7	68	·067		W N W
24	30·475	30·402	30·439	30·439	·091	18	30	27	25·0	16	5·0	57	·095		S W.	27·979	·026	19·3	14·0	90	·191		?
☾ 25	30·401	30·266	30·225	30 297	·141	23½	40	34½	36 0	21	7·7	56	·138		W S W.	27·887	·092	29·3	10·0	71	·202		S W.
26	30·223	30·218	30·268	30·236	·090	31½	48	38	39·2	18	6·5	49	·165		S W.	27·924	·038	37·0	7·7	84	·262		W N W
27	30·166	30·186	30·099	30·150	·086	34	42	41	39·0	10	3·8	74	·199	1·884	N E.	27·771	·153	35·3	4·3	91	·216	0·127	S.
28	29·880	29·818	29·878	29·859	·292	51	54	54	53·0	14	14·0	93	·390	0·020	S.	27·573	·199	48·0	12·7	100	·418	0·068	S W.
29	29·831	29·827	29·897	29·852	·026	42	45	42½	43·2	6	9·8	84	·252	0·015	N E.	27·656	·084	33·7	14 3	86	·210	0·023	(var.)
30	30·076	30·041	30·142	30·086	·235	35	41	34	36·7	10	6·5	49	·125		N W.	27·838	·181	28·3	5·3	100	·174		N W.
31	30·235	30·182	30·218	30·212	·125	28	38	31	32·3	13	4·3	45	·103		N W.	27·884	·047	25·7	5·3	74	·149		N W.
Means	30·016	29·975	30·017	30·003	·206	30	38½	33⅓	34·0	13	8·0	64	·165	5·230	N81°W	27·693	·161	29 7	9·7	80	·184	1·655	

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

MAY, 1859.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Steam and its Condensation. By THOMAS PROSSER, C. E.

CHAPTER V.

(Continued from page 223.)

Some Practical Suggestions on the Philosophy of Surface Condensation.

Although the promise of great saving of fuel and increased durability of boilers, has not been realized by Hall's invention* of a surface condenser, the cause does not appear to have been sufficiently investigated. One writer† attributes it to being "extremely difficult to keep it tight," which is purely imaginary and entirely at variance with every reliable authority.‡ The error probably arose from the saltiness of the water in the boilers, occasioned, not by leakage through the glands around the tubes of the condensers, but from the pumping of sea-water into them, to save the trouble of attending to the evaporator, as Mr. Hall himself states in his pamphlet, was done while he was on board, and which was only discovered by accident.

Engineers, like other people, are very apt to adopt the easiest method of supplying an immediate want, and the use of the evaporator implies the necessity of blowing off the residuum when a certain amount

* Bourne on the Steam Engine, page 64, says, "the weight and expense are formidable objections, and it does not act as a preservative of the iron of the boiler from corrosion." One vessel, he says, had 22 miles of copper pipes for the condensation of the steam.

† Note Journal of the Franklin Institute, Vol. xxi, (3d Series,) page 141.

‡ See London Mechanic's Magazine, Vol. xxxiii, page 46, and Vol. xxxvii, page 471, where the *Megæra's* condensers are reported to be in good condition after four years use, during the last three of which they had never been opened for inspection.

of concentration is arrived at, just the same as in any other boiler, the only difference being, that the scale is much softer, and therefore more easily removed.

Another objection was to the oil, grease, and other filth, which choked up the numerous small tubes, so as to require a plentiful supply of potash and hot water, and considerable poking with a stick into seven thousand ½ inch pipes, having an aggregate length of 14 miles, that being the complement of the *British Queen's* condensers.* In consequence of the coldness of the condensing water, this filth stuck with extraordinary tenacity, and the enormous quantity of cold water required for condensation, rendered an extra cold water pump necessary, while the feed water was reduced to 22° C., even after passing around the chimney.

In the sequel, I shall endeavor to show that the defect of the system, lay wholly in the low temperature of the working steam and of the condenser, and that nothing more than an increase of both was necessary to more economic action, equal in every respect to that assigned to Pirsson's method.

That Hall's condensation was almost perfect, does not admit of a doubt, and therefore it is entitled to rank as the first of its class, and has a value far beyond all others for comparison ; in fact, it is the only one affording any fixed data upon which to found calculations of what may be expected under other circumstances.

Mr. Hall then allowed 2800 square inches of surface for the condensation of 60,000 cubic inches of steam per minute, at the pressure of 4 lbs. per square inch above the pressure of the atmosphere; and he employed 100 lbs. of condensing water on the outside of fifty thin copper tubes, each 3 feet long and ½ inch inside diameter, to do it with, and called that equal one H. P.† In other words, he allowed per H. P. 19 feet 5 inches of surface for the condensation of 1·6 lbs. of steam with 100 lbs. of water per minute.

In Chapter III, Table I, I have adopted for data, the workings of the "*Wilberforce*" steamer as furnished by Tredgold, (page 385,) so far as I can do so ; but, inasmuch as the steam was used expansively for nearly half the length of the stroke, I have applied some of the data previously given for full steam, as I consider that the only proper basis for calculations of this kind.‡

It will be convenient to omit in our calculations, for the present, as much of the condensing surface as the evaporator may be supposed to require, for, although I have no doubt that it was used when the best results were obtained under Mr. Hall's system, it appears to have been abandoned at an early period; and in the case of Pirsson's system, it forms an entirely separate part, on paper, for it has never obtained general, if any, acceptance in practice. In my system, on the

* London Mech. Mag., Vol. xxxii, page 763.

† Repertory of Arts, Vol. iii, (4th Series,) page 78.

‡ The "*Wilberforce*" had 17·4 feet of surface for condensation, and employed 80 lbs. of condensing water, and as the steam contained 640° C. of total heat, and the condenser was at 15° C., there had disappeared 625° C. which had gone into the condensing water, and as that acquired but 9° C., it follows that the feed-water was then 1·16 lbs., or 1-69th of the condensing water. This shows pretty conclusively that Mr. Hall's calculation for full steam is as correct as can be expected.

contrary, although separate and distinct from the main condenser, not only is it inseparable in practice, but a heater also forms a necessary part in the arrangement.

We will therefore assume that instead of 19 feet 5 inches, 16 feet of area of surface is sufficient for the condensation of the steam necessary to furnish one H. P.

Before proceeding in this matter, it may be advisable to lay down a few succinct dogmas or *principal conditions* which *govern* CONDENSATION in *surface condensers of steam engines*, with regard to the amount of surface required. The amount of *heat*, then, which water will absorb in equal times, is in accordance with the following *conditions:*

1st. The greater the condensing surface,

2d. The greater the difference between the average temperatures of the steam entering the cylinder and condenser, and the condensing water entering and leaving the condenser,

3d. The higher the average temperature of the condensing water,

4th. The less the difference between the total heat entering the cylinder and leaving the condenser,

The greater is the amount of condensation, and a mere inspection of the Table I, Chapter III, will show that every one of these *conditions* is greatly in favor of a general high temperature.

We will therefore proceed to eliminate them with the view of obtaining the condensing surface necessary under each system, to condense the same weight of steam, assuming that Hall's, as the standard, requires 16 feet.

$$\text{Thus we have, } 8{\cdot}1021 = 16, \left(\tfrac{48{\cdot}5}{62{\cdot}0}, \tfrac{142}{212}, \tfrac{596{\cdot}1}{616{\cdot}8}\right);$$
$$\text{and, } 3{\cdot}5760 = 16, \left(\tfrac{48{\cdot}5}{89{\cdot}0}, \tfrac{142}{314}, \tfrac{560{\cdot}4}{616{\cdot}8}\right).$$

In round numbers therefore, Require respectively,	Hall,	Pirsson,	Prosser,
of condensing surface per H. P.	16 ft.	8 ft.	3·5 ft.
And of condensing water,	69 lbs.	13 5 lbs.	4·13 lbs.

The condensing water absolutely required by Hall and Pirsson greatly exceeds these amounts, by the amount of condensation in the cylinder, less that portion of it which is produced by external radiation. Hall's and Pirsson's condensing surfaces, it must be remembered, are required only for condensing the working steam, and not to make up for the boiler waste. To make mine comparable with them, will require but $2{\cdot}8' = 3{\cdot}5 \times {\cdot}8$; because my heater really forms a part of my condenser, as will be better understood by referring to my article "On the Power of Steam,"* where I allow $3{\cdot}75'$ per H. P.

A few words are also necessary in explanation of the small quantity of water (4·13 ℔s.) required for condensation. It would be 5·9 ℔s. but for the fact, that ·3 of the steam is merely transferred to the water in the hot-well, and is allowed to escape as steam uncondensed, as is explained more fully in another article on "Steam and its Condensation."†

Still there is difficulty in comparing the other two systems with

* Journal of the Franklin Institute, Vol. xxxvi, (3d Series), page 11. † Ibid. page 89.

mine, on account of their great dissimilarity in apparatus and principle of action in all that constitutes a condensing engine; and yet, I have been asked disparagingly, in what respect my condenser differs from any other? Says one, you *only* omit the air pump! another, you *only* condense with boiling hot water!!—and yet another, you *only* evaporate from the hot-well instead of a boiler!!!

Are not these enough? Look at the resulting consequences, and many more *onlys* will have to be added to the list before all the differences are run down: for instance,

> The boiler surface required is *only* reduced from 30 to 6·4 feet.
> The coal consumed per hour per H. P. is *only* reduced from 10 to 3·2 lbs.
> The condensing surface required is *only* reduced from 16 to 2·24 feet.
> The condensing water required is *only* reduced from 110 to 4·167 lbs.

And the weight of steam per minute per H. P. is only reduced from 1·6 to 1·00 lbs.

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CHAPTER VI.

On the Power and other Mechanical Properties of Steam.

The "absolute mechanical power" of steam is shown in my Table before referred to* column 8. This column is the product of the pressure (column 3,) multiplied into the expanded volumes (column 7,) which *must* give the whole mechanical power in the steam beyond dispute. But there is one thing remarkable which I believe has not before been observed. It is this, for every degree (C.) of heat added to the temperature, there is an increase of mechanical power equal to one pound raised 154·40222 feet; for it will be perceived that, for each decade of °C. of the Table, (column 8,) there is a constant and uniform increase of 1544 feet, notwithstanding the chaotic appearances of the increments of column 3, and the decrements of column 7. And therefore the formula of Regnault† ($\lambda = 606{\cdot}5 + {\cdot}305\ \mathrm{T}$,) which represents the total heat in the steam is of precisely the same structure as one representing its total mechanical power ($\lambda = 42071 + 154{\cdot}40222\ \mathrm{T}$,) and also the rate of absorption of heat by water ($\lambda = 100 + {\cdot}4\ \mathrm{T}$). Thus connecting these three great physical facts with each other by simple constant arithmetical increments. Could we but connect the temperature, density, and pressure of steam in a similar manner a far greater achievement would be accomplished.

But there is yet another still more remarkable coincidence which I have also discovered, between the laws of development of mechanical power by the conversion of water into steam, and the law of gaseous expansion by heat. Both these laws are in the simple ratio of arithmetical increments, and are identical with each other.

Referring again to my article "On the Absolute Mechanical Power in Steam,"* I would observe, that, column 8 was not calculated by multiplying column 3 by column 7, as may be supposed from the note to page 7, but each value was calculated by the formula $\frac{p}{t + 272{\cdot}47905}$‡ as given at p. 5, and that accounts for the discrepancies in some of the

* Journal of the Franklin Institute, Vol. xxxvi, (Third Series,) p. 7.
† Memoirs l'Academie de France, Vol. xxi, page 727. ‡ Ibid. page 119.

units of value. It is of course easy now to see why it should be so, but the calculations were made before the fact was observed, that column 8 was composed of the products of columns 3 and 7, and it was still some time after that before it was discovered that the increment for each degree was a constant quantity, and still more recently that I discovered that *the same number of degrees which will double the mechanical power of air from 0° C. while its elasticity remains the same, will also double the mechanical power of steam, in its conversion from water of the same temperature and under the same tension.* The mechanical power in steam converted from water at 0° C., is stated in column 8 to be equal one pound raised 42071 feet, and as the increment for each °C. is, as before stated, 154·40222, it follows that (42071÷154·40222=) 274·479° increase of temperature will double the mechanical power as stated.

From this digression I return to the absolute mechanical power developed during the conversion of one pound of water into steam at the respective temperatures of 106° C., 130° C., 180° C., and applied to the three systems of

	Hall,	Pirsson,	Prosser.
One pound raised in feet,	58438	62144	69864
Total steam pressure at entering the cylinder per square inch,	18 lbs.	39 lbs.	146 lbs.
Back pressure on the piston,	4	5	20
Unbalanced steam pressure,	14	34	126
Per centage of power applied in power developed,	·82	·90	·98

The last line being equivalent to deducting 18, 10, and 2 per cent. for condensation in the cylinder, *omitting* all consideration of the *extra* power necessary to work the air and cold water pumps, with (it is believed) all other debatable matter.

Taking Hall again, as the standard of power *developed*, and allowing, as he did, 1·6 lbs. of steam equivalent to one H. P., we have for the power developed by one pound of steam,

lbs. raised 1 ft.

$58438 \times \frac{14}{18} \times ·82 = 37275$ by Hall.

$62144 \times \frac{34}{39} \times ·90 = 48759$ " Pirsson.

$69864 \times \frac{126}{146} \times ·98 = 59087$ " Prosser.

	Hall.	Pirsson.	Prosser.
And for the weight of steam per minute per H. P.	1·6	1·223	1·009 lbs.

It appears to me very plain now, that Hall's condenser died of the same complaint as one of Shakspeare's heroines, "too much of water hast thou, poor Ophelia."

The proportions of boiler and condenser surface, as well as of fuel and condensing water, will, of course, be decreased in proportion to the feed water required, therefore making the necessary correction we have,

		Hall,	Pirsson,	Prosser,
Boiler surface required per H. P.,	feet,	30	20	6·4
Coal per hour "	lbs.,	10	6·4	3·2
Condensing surface "	feet,	16	6·4	2·24
Condensing water, "	lbs.,	110	16	4
Feed water per minute "	lbs.,	1·6	1·223	1·00

These enormous gains will create no surprise in those who have well studied the subject of heat, for the best physicists maintain that not more than from $\frac{1}{8}$ to $\frac{1}{6}$ of the whole heat developed in the furnace of the boiler, is ever converted into effective mechanical power where the vacuum condenser is used, which washes the *life* out of the steam in a flood of cold water.

I will conclude this Chapter by stating some broad and fundamental differences between my system and all others, and first as to

The Low Pressure Condensing Engine.

Must have an air pump.	Mine must *not* have an air pump.
Condenser must be cool.	My condenser must be hot.
Must be below the boiling point.	Mine must be above the boiling point.
Does not admit of vapor from condensation from the hot-well.	Admits of vapor for condensation from the hot-well.
Reduces the temperature of the steam under the delusion that it is possible to use the power obtainable therefrom, and yet not cost more to restore it than that power is worth.	I reduce the temperature of the steam only so much as is necessary to bring the water under control.

And, Secondly, whether Condensing or Non-condensing.

Their excellence depends on keeping down the back pressure on the piston.	Mine depends on keeping it up.
Must regulate the steam to the load on the engine by the increased or decreased pressure of the *working steam* upon the piston.	Mine is more economically regulated by decreasing or increasing the *back pressure* on the piston.
The Noisy System.	The Quiet System.

Russian Inland Navigation.

(Continued from page 232.)

II.—*Artificial Systems of Navigation of the West of Russia.*

In the west of Russia the river Dnieper is united artificially with the western Dwina, the Niemen, and the Vistula, by means of the canals of Berezina, Oguisk, and the Royal Jolith Canal.

Canal of Berezina, between the Berezina and Oulla rivers.

This communication was begun in 1797, and the first floats of timber passed through it in 1805.

A canal of junction, 5 miles and 550 feet long, has been dug between the lakes Plavia and Bereschta.

From the Plavia lake, toward the Berezina river, the route passes through the Manetz lake, and by the Sagolla river ; from the Bereschta lake to the Oulla river, it follows the small river of Beretcha and Esse, and traverses lake Gessaie, from which the Oulla derives its source.

The most difficult points for navigation on the Sergout and the Bereschta, as well as the mouth of the inlet to lake Gessaie and the outlet from it of the Oulla river, *are passed by means of independent canals*

along the river banks, and a canal of the same kind has been dug for the improvements of the Oulla, near the town of Tchachmiki.

The aggregate length of these canals for re-placing the channels of the streams is $8\frac{1}{3}$ miles, and the entire distance, from the confluence of the Sergout and the Berezina, to that of the Oulla with the western Dwina, is about $98\frac{2}{3}$ miles.

For this distance navigation is effected by means *of locks of wood* about 140 feet long and 30 feet broad.

The lock at the extremity near the Berezina has been built near the mouth of the Sergout, and the last lock on the Oulla is $30\frac{2}{3}$ miles near its mouth, on the canal of Tchachmiki, which replaces the river channel further up.

The object of the Berezina canal is to transport the timber of the government of Minsk towards the Western Dwina. This object has been effectually accomplished, for there are annually passed by this canal towards the Dwina and down the latter stream to Riga, timber for masts and for other purposes, valued at $562,500.

At the same time there is transported on these floats a certain amount of other cargoes, consisting of the products of the soil, but there does not exist as yet a trade by water between the Dnieper and the Western Dwina, and vice versa, by the route of the Berezina canal. If, in consequence of a future increase of industry, the necessity of such a navigation should be felt, the Berezina system would need much improvement, not only on the Berezina and Sergout rivers, but also on the Summit level canal itself, at the Manetz and Plavia lakes.

The Oghuisk Canal, built between the Yatzalda, which falls into the Bripaik, and the Stehara, which is a tributary of the Niemen, had already been began by the Polish government in 1770; and the works having been suspended, they were again resumed in 1779, by order of the Emperor Paul the First. The canal was first navigated in 1804.

The Summit Level canal, dug for a length of 32 miles, begins at the Yatzdda, and passing the lakes Voulka and Vigonostche, terminates at the Itchara.

The Vigonostche lake forms the dividing point at the canal. *The locks are of wood*, and admit the passage of boats 84 feet long and 14 feet broad, with a draft of water equal to three feet.

The sinuosities of the channel of the Itchara, which most obstruct the navigation, for a distance of $78\frac{2}{3}$ miles from the mouth of the Oghuisk canal to the City of Slomini, have been improved by means of independent canals along the river. In order to raise the level of the water, at places where the river is not sufficiently deep, five dams, with flood gates, have been built with *wooden* abutments.

On the lower part of the Itchara, from Slomini to the Niemen, retaining dikes have been built in various places, and the channel has in several places been straightened and improved.

The navigation on the Oghuisk canal is principally toward the Niemen. The principal articles carried are timber and the local products of the soil of the government of Minsk and Volhynia. About 50 boats and 2300 floats of timber annually pass through this canal.

The improvement of the navigation of the Itchara did not constitute a part of the original product for the Oghuisk canal, but was made subsequently, and there still remain some unexecuted projects for the further improvement of the stream.

The construction of the *Royal Canal*, between the Pina, which falls into the Yatzdda, and the Bug, which empties in the Marie, had been begun under the reign of Stanislas Augustus, King of Poland, but at that epoch the only work finished was the excavation of a large ravine between the sources of the Pina and Moukhavitz rivers. This ravine, filled with water in the spring, permitted the passage, during a very short period, of some floats of timber and a few boats, of a light draft, from Pinsk to Brest-Sitovsk.

The Russian government, hoping, by the construction of a regular water communication, to convert the Royal canal into a very useful channel, in a strategical point of view, and one at the same time very advantageous for developing the industry of the vast region, of which Pinsk is the centre, has often had under consideration the propriety of finishing the work already begun upon the route, but owing to various causes this idea remained unexecuted until the year 1837, when the projects prepared for the completion of the Royal canal were confirmed, and by order of his Imperial Majesty, the necessary funds were set apart for completing the work.

The projects for establishing the Royal canal were drawn up according to two different ideas; first, the opening of the navigation on the upper part of the Pina river by the canal joining this river with the Moukhavitz, and improving the navigation of the latter by means of locks; and second, the improvement of the navigation without the aid of locks.

The first of these projects would require the collection, on the summit level, of a mass of water in reservoirs much less considerable than the second, but as researches on this subject demonstrate the possibility of borrowing, annually, from the lakes situated near the Summit Level canal, nearly 137,200,000 cubic feet of water, and as, moreover, it has been found practicable to divert into these same lakes the head waters of the Pripait and the Towra; the second project has been chosen, on condition, nevertheless, that in case of extraordinary droughts, which, however, according to the statement of the inhabitants of the country, occur very rarely, there are to be built, at the two ends of the canal, temporary dams, *giving the means of feeding with the summit waters, alternately*, the Pina and the Moukhavitz, and to cause boats to pass in caravans or fleets, *as is practised on the Vishney Volotchok canal.*

The second project is to be preferred to the first for another reason, viz : that in constructing the Royal canal without locks, it becomes necessary to enlarge all the feeders leading into the canal, and in this way the feeders themselves are converted into navigable canals; so that, at very little cost, there is established near the Royal canal, a net work of navigable communications, contributing not only to the drainage of the vast morasses of this country, but also to the develop-

ment of agriculture and industry. Even supposing it to be necessary, notwithstanding these calculations, to construct a few locks on the upper portions of the Pina and Moukhavitz rivers, this should not cause the least modification in the plans of the canal and feeders.

The Summit Level canal, between the Pina and the Moukhavitz, is $35\frac{2}{3}$ miles in length. On the upper parts of those streams, where the navigation is difficult in consequence of the shallowness and crookedness of the channel, canals have been built parallel with the stream. Navigable feeders unite the Royal canal with the lakes Belojai and Oraikhoffsxajai, as well as with the upper parts of the Pripait river, and other lakes contiguous to this stream. The total length of the canal feeders is $99\frac{1}{3}$ miles.

The whole distance from the mouth of the Pina, on the Yatzolda, near Pinsk, to the confluence of the Moukhavitz and Boug, at Brstt-Gitovsk, is $144\frac{3}{4}$ miles; of this distance the Pina occupies $34\frac{1}{3}$ miles; the Independent canal, on the upper part of the Moukhavitz, $\frac{2}{3}$ of a mile, and the Moukhavitz itself, 62 miles.

All the work on the Summit Level canal and on the canals along the river, and also the feeders, were finished in 1842, and all the remaining work, including the improvement of the channels of the Pina and Moukhavitz proper, has since been completed.

III.—*Improvement of River Navigations.*

Volga River.—On all its courses from Rybinsk to Astrachan, the navigation of this stream is obstructed by very few difficulties, but in ascending above Rybinsk towards Tver, and still higher as far as the source, the channel of the river is encumbered with rocky bars and sand banks. Notwithstanding that by the course of the Volga it is only 250 miles from Rybinsk to Tver, yet it took, in dry seasons, not less than six weeks to make this trip, with a draft of water of from 14 to 18 inches.

This state of things exactly in that part of the Volga which leads from Rybinsk to the Vishney Volotchok system, caused great injuries to this avenue of trade for the productions of the interior of Russia destined for exportation, and by which also the capital is supplied with the greater part of its provision and articles of consumption. The government accordingly resolved to have recourse to artificial means for deepening the channel of the river on this part of its course.

The following measures were relied upon for effecting the end in view. *Dikes*, confining the channel within narrower limits, were to be erected, *the effect of which would be to deepen, and at the same time straighten the channel.* The second resource consists in the establishment *of a reservoir* on the upper part of the Volga, *the special object of which is to feed that stream during the summer months.* The construction of the retaining dikes was begun in 1837, and in 1841 a dam with flood gates, &c., was begun in the bed of the river so as to form *a reservoir* above it in the lakes Volga, Paino, Visslouga and Stairga.

The dikes, by confining the channel within narrower limits, increased its force and tended to remove the deposits of earth in those parts where the stream is not obstructed by them, and in this way they have already produced a very useful effect, by deepening the greater portion of the bars which formerly obstructed the Volga between Rybinsk and Tver. *The reservoir* was designed with a view to its accumulating annually, at the outlet gates, a sheet of water $16\frac{1}{2}$ feet deep, which is equivalent to holding in reserve 10,976,000,000 cubic feet of water during the spring floods, *to be subsequently used in filling the channel during the times of the passage of the fleets of arks.*

By these means it is hoped that the inconveniences heretofore experienced in navigating the Volga, between Rybinsk and Tver, may be obviated to such an extent that boats and arks, drawing from 24 to 26 inches of water, may ascend the stream between these points in about 20 days.

Experience has shown that the water permitted to flow in the Tvertza river from the Zavodsk reservoir, increased the depth of the channel not only in the Tvertza, but in the Volga also, for a considerable distance from the mouth of the Tvertza, and even as far as Rybinsk, when the quantity permitted to flow from the reservoir is very considerable. If we take into consideration, that the supply from the reservoir of the Upper Volga, may be five times as great as that which is drawn from the Zavodsk reservoir, during the periods when the Mstino sluice is closed, for the purpose of raising the water in the Tvertza river, we can hardly fail to be satisfied that the channel of the Volga, particularly after it has been straightened and improved, will be deepened very materially by the Upper Volga reservoir.

Timber being very abundant on the head waters of the Volga, *the whole of the constructions about the dam, waste-weirs and flood-gates of the reservoirs are of that material.* The sluices have five openings, permitting the passage of a stream of water 142 feet broad.

The Dnieper River.—A little below the City of Ekatermoslav, the course of the Dnieper is obstructed by cataracts which only permit a descending navigation, and not even this, except during the spring and autumn floods.

The cataracts of the Dnieper extend for $43\frac{1}{3}$ miles. There are nine principal falls where even the descending navigation is exposed to considerable danger and eight rocky bars.

The government has for a long period been endeavoring to improve the navigation at these cataracts, and as far back as 1807 a lock was built at the Nainasytchik fall, which is the most dangerous of them all.

Neither this lock, however, nor the other works constructed at the same period, afforded the necessary aids to the navigation, and a careful study of the other measures to be taken, continued until 1833.

Independently of this, the affair of the improvement of the navigation at the Dnieper cataracts, was at the same time considered under a more general view, and in order that time should be afforded for them to make general investigations, His Imperial Majesty directed

that, for the moment, no partial efforts should be made to create an ascending navigation, but that all the measures adopted should be limited to the means necessary to facilitate the descending navigation throughout the summer.

The project prepared with this object contemplates the cleaning out of the channel at all the bars, and establishing at each one of the nine cataracts, above mentioned, in the bed of the stream, in the direction of the main current, a canal sufficiently deep to admit of the passage of boats; *a dike of stone being at the same time raised on each side of this canal to protect the boats from the effects of side winds;* and the channel of the river above and below the canals being straightened and improved.

In accordance with this project, the canal at the fall of Starakaidatsk was finished in 1837, this fall being the first encountered in descending the stream. The effect *completely answered the expectations*, and since then, down to the present period, the same operations have been continued at the eight other falls. These works are now completed, and at present there is under consideration a project for additional ones by means of which to render practicable an ascending navigation, and thus fully accomplish the purpose in view.

The River Tzna.—Navigation on the Tzna from the city of Moschansk, is only passable during the spring. During this short period 500 arks, carrying about 1,500,000 sacks of grain, annually descend this river. Having taken their cargoes to Rybinsk the arks return empty to the mouth of the Tzna, and habitually ascend it to the points where their cargoes for the succeeding spring are accumulating. This ascent of the empty arks is effected every year in the fall, and at this time only by the aid of the water which is suffered to flow simultaneously from out the mill dams erected on or near the Tzna.

Cargoes on the Tzna are carried in preference on arks of large dimensions, such, for example, as those of Mokshany and Gouniduki, carrying from 480 to 720 tons.

The navigation on the Tzna, in its natural state, is, during some seasons, much impeded in consequence of the shallowness and crookedness of the channel, and the want of the water derived from the mill ponds. This circumstance has constantly kept alive the solicitude of the government on the subject, and caused it to have recourse to artificial means for its improvement.

During the years 1836 and 1837 the subject was investigated for the purpose of establishing on the Tzna a system of locks from Movshansk to the confluence with the Mokscha as well as above Movshansk to Tamboff.

The question having been discussed, *it became fully evident that the construction of locks would not in the least correspond with the wants of the trade* in grain of this district, and that the measures to be taken should be limited to the amelioration of the descending navigation during the spring.

With this view a canal six miles long was dug in the valley of the Tzna during the years 1839 and 1840. This canal commenced a little

below Movshansk and extends between the villages of Moscetaspiro and Geravo, for the purpose of avoiding the sinuosities and obstructions of the channel, which, experience has shown to be most injurious. At the same time with this, there were several other improvements effected in the bed of the stream. These measures have had so beneficial an effect on the navigation that the number of arks leaving Movshansk and its environs have begun to increase, whereas formerly the number had been limited, in consequence of the dangers and retardations to which the traffic was subjected, to such an extent, that it occasionally happened that the arks could not get out of the river at all, and were obliged to lose the season.

The Western Dwina.—The strong bars on this stream, which im peded the navigation during low water, have been cleared out. In addition to this, the right bank of the stream near the fortress of Dinaburg, has been riveted with facines and raised by means of embankments, with the requisite hydrotechnical constructions, the object of the whole being to protect the fortress from inundation.

At the city of Riga there have been constructed in the bed of the river, as an experiment, *dikes for the purpose of narrowing the channel.* These dikes have been built of various dimensions, and in different ways, and various directions have been given to them, for the purpose of determining, by experience, the best means for improving and deepening the channel.

The River Neva.—This river, from its outlet from lake Ladoga to its mouth in the Gulf of Finland, has every where a depth sufficient for fully loaded boats, except at certain places in the neighborhood of Rehla, where isolated rocks and stony bars require that the channel should be cleared out. This has accordingly been done, and at present the navigation is carried on without difficulty.

Tow-paths have been built along the river banks to facilitate the towing of the boats which ascend the river.

The River Siass, belonging to the Tykhvine system, is shallow and has a rapid current. The greatest obstacle to the navigation is the fall of Geitz. At this place the river has been improved by the construction of a lock with a chamber, *connected with which is a dam, which is removed every fall.* The supports of this dam rest in cast iron sockets let into the rocky bottom of the stream, and *the whole being taken away at the close of navigation*, the ice during the spring and fall can pass off freely on the whole breadth of the river.

Artificial tow-paths have been constructed on the Siass, at the points where difficulties are encountered in consequence of the crookedness of the channel and the rapidity of the current.

The River of Soukhona.—The first few miles of this stream, after it issues from lake Konbensk, offer many difficulties for the navigation, and it occasionally happened, during very dry seasons, that it was entirely interrupted. The establishment of a lock on the canal along the stream, and of retaining dikes in the bed of the river, have not only removed these difficulties, but have, at the same time, secured the additional advantage of raising the level of the water in the Konbensk

lake, and increasing the depth of the channel on the shoals which obstructed the mouth of the Tovosovitz, a navigable tributary of this lake, belonging to the system of the canal of the Duke Alexander of Wurtemburg.

The Volkhoff River.—The rapids of Ptchefsk have been cleared out, where boats navigating the Ladoga canal, coming from the system of Vishney Volotchock, encountered obstacles arising from the shallowness of the water and the existence of detached rocks on the bottom of the river. It became occasionally necessary to lighten the boats in the fleets, to 24 or 26 inches of draft. To obviate similar inconveniences encountered on the same river, and particularly at the Volkhoff rapids, *movable dams have been employed, for the purpose of temporarily raising the level of the water.* In this way, at the least possible cost, means have been found for avoiding the much more heavy expense which the permanent improvement of the Volkhoff river would necessarily have imposed.

Goryne River.—This stream, which is one of the navigable affluents of the Pripait, has been considerably improved by the establishment of *three wooden locks.* The necessary precautions have been taken by the ministry of public works to prevent these locks from being injured by the spring floods.

Sveet River.—On this river, which joins the Ladoga and Onega lakes, there are several rapids, but the channel is almost every where deep enough, even during the low stages, for the passage of boats coming from the Marie system of navigation.

No other inconveniences are met with on the Sveet, than some very short turns in the river. These crooked channels were obstructed with detached masses of rock, but the largest of them, which were under the water, have been blown to pieces by gunpowder, and the others have been cleared away, during the lowest stages of the stream. For the reason that the decked boats on the Marie system return from St. Petersburg to the interior, tow-paths have been made along the banks of the Sveet, wherever there are rapids, so as to facilitate the ascent of the stream.

Sheksna River.—Similar tow-paths have been built in several places along the banks of the Sheksna, particularly at the Boroivmovsk rapids, where, in consequence of the velocity of the current, forty horses are scarcely sufficient to tow a single boat.

Finally, among the measures taken for facilitating navigation, must be enumerated the construction, on Ladoga lake, of four light-houses, for pointing out the way between the mouths of the Sveet, the Siass, and the Volkhoff, and the outlet of the Neva.

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*The Panama Railway.** By V. Wyatt, C. E.

There are but few public undertakings which have so much interest attached to them as the Panama Railway; connecting as it does the two large oceans of the world—the Pacific and the Atlantic—and tra-

* From the Lond. Civ. Eng. and Arch. Journal, Jan., 1859.

versing the backbone of an isthmus which hitherto had been deemed insurmountable; passing to and fro the commerce of the eastern and western parts of the world, and opening up the riches and glories of the Pacific,—this railway bids fair to assume great commercial and general importance. India, Australia, California, British Columbia, and the rich provinces of Central and South America, on the Pacific side, have had a new and direct overland route opened to them by the construction of this isthmus railway.

A casual inspection of the American isthmus and the demands of commerce would seem to dictate that a canal between the two oceans, by which the shipping of the two seas could be interchanged without breaking bulk, would have been a far more useful and commendable work than a railway. So natural is this conclusion, that from time to time various and diversified have been the projects for a ship canal between the two seas, and these projects date as far back as the Spanish Conquest. Shortly after Columbus had cruised about and discovered the Central American waters, and when the enterprising Spanish cavalier, Nunez de Balbao, had actually mounted the Andes, and espied, for the first time by a European, the Pacific Ocean, more than three centuries since,—the world became convinced of the necessity of some great work on the isthmus. There have been proposed from time to time, two different ship canals at Nicaragua—one with a Pacific terminus at San Juan del Tur, and another at Realejo in the Pacific, where the summit level in the former case is 615 feet above the sea, and in the latter about 212 feet. The latter route is somewhat circuitous and uncertain in its data. The Panama crossing of the isthmus has also been advocated, presenting equally favorable features for a canal as it does for a railway. There are no abrupt elevations and depressions; the distance can be made the shortest possible across the isthmus, being only about 30 miles in a straight line; and its greatest elevation above the mean level of the two oceans, by careful selection of country, need not exceed the highest point of the Panama Railway, which is only 263 feet, and this summit height being of very short continuance. Then there are the Darien and Atrato routes; the former of which is much controverted, and its assumed data are insufficiently supported by reliable surveys, the summit being stated by one exploring party to be all that the mind can desire, and by another and more recent exploration as beset with mountain ridges and insurmountable obstacles; the latter route (the Atrato,) has the objection of lockage up the rivers which descend from the summit each way, and it is very circuitous. There is no difficulty about the level of the two oceans, as the mean tide level of each are identical, the only difference being that the spring tides in the Atlantic are only about 18 inches, whereas in the Pacific they are from 10 feet at San Juan de Nicaragua, to about 18 feet at Panama Bay.

The climate of the coast of Central America and the isthmus of Panama, is of the most unhealthy character, and quite unfitted for Europeans. The atmosphere is hot, steamy, damp, miasmatic, and fever generating. The European when he lands on this coast, feels his en-

ergies relaxed, and his whole spirit depressed. This was the greatest difficulty the pioneers had to contend with in the construction of the Panama railway. The railway works were of a light character, and would have been deemed trivial in healthy spots; but when the theatre of operations was the isthmus of Panama, then the problem was, not merely to organize men for their work, but how to keep workmen alive in such a pestilential place, continually attacked as they were by intermittent fevers and agues. Every gang of men was being continually broken up by disease, desertion, and excessive mortality. It has been stated that 10,000 men lost their lives in the making of this railway, and that the sleepers in the line count the numbers of bodies buried there; but this calculation, like many other popular rumors, is of course over-estimated. It is very certain, however, that the company did import on to the isthmus during the time the works were going on more than 3000 Americans, Irish, Chinese, and Negroes, besides the casual supply of labor which found its way to the works from time to time. The major part of these men fell victims to the isthmus fevers; the Chinese committed suicide to a wholesale extent; many succumbed to their intemperance and irregularities under a tropical sun; and some, including many shrewd Americans, "cleared off," and departed from the isthmus as soon as the seeds of disease or the horrors of the spot became apparent to them. The inconveniences and risk of working in such a climate may be imagined from the fact that the temperature on the isthmus is from 82° in the morning to 90° mid-day Fah. in the shade, and this continued all the year round, with no greater variation than 5° or 6°; and accompanied with this is the unhealthy steam from a tropical rainy season extending over eight months in the year. The sea water in the two oceans adjacent to the isthmus, taken at ten feet below the surface, averages 84° Fahrenheit.

The Panama Railway starts on the Atlantic side from Navy Bay, at a point called by Europeans and New Granadians, Colon, and by the people of the United States, Aspinwall, after one of the railway promoters. Colon or Aspinwall town, which has been created by the railway, has a very backwoods-settler look about it, being composed of wooden houses, stores, shops, and hotels, and has only one permanent looking structure, viz., the railway freight and store-house, built of stone with an ordinary iron roof of 78 feet span. The American engineers point to this as the very *chef d'œuvre* of engineering. Aspinwall is on the eastern side of Navy Bay, on an almost submerged coral reef, standing only about three feet above the Atlantic. It is a wet, swampy, and aguish-looking spot; the rains are incessant; and yellowish-white unhealthy looking faces are visible everywhere amongst the railway employees and residents. Panama is considered a wet place, but in comparison with Colon or Aspinwall, it sinks into insignificance; the railway rain-gauge at the latter place showing a register in one rainy season of eight months, of 110 inches of rain. England is called wet with an average of 26 inches of rain for the year. Behind Aspinwall is a rotten swamp for miles, the miasma from which salutes the nostrils of the voyager when landing ; and he is moreover

advisedly informed that a residence of more than twenty-four hours for a new comer, will probably introduce him to a tropical fever. The old outlet on the Atlantic side for the mule travel of the isthmus was at Chagres, situated to the west of Navy Bay, being at the mouth of the Chagres river; and a never-to-be forgotten place by Californian travelers, who have so often left the bones of their friends on its miserable shores.

The railway after leaving Aspinwall crosses the dismal swamp before alluded to for a distance of seven or eight miles ere it reaches terra-firma; it then escapes from this floating bog, with all its rotten, rank, tropical vegetation. The greatest amount of mortality resulted on this part of the line in the first construction; here not only from the unhealthfulness of the situation, but also from a total absence of any properly organized commissariat to supply the men with the necessary and proper comforts; and also allowing the free circulation on the works of the raw spirits so cheaply imported on to the isthmus from the West Indies. Various were the expedients adopted by the American engineers in this swamp to form a foundation for the road, and to economise labor, time, and expense. Crib-work (the American term for large wooden boxes, formed of large timber logs, which are loaded with stones or gravel and sunk into position), fragile and temporary trestle-work, and staging on piles. All these methods have rotted and nearly disappeared, as might be expected in a climate where the durability of timber is estimated by months instead of years; and this fragile and temporary work is being substituted, or rather buried up by a filling-in of good, hard, dry, rocky material, with occasional tips of clay to bind the whole together in one mass, enclosing in its bulk the original piled staging and crib-work; the material being obtained from side cutting on the Panama side of the swamp. There is one merit however in the swamp part of the railway, which is that it is the only direct and straight part of the line; most of the rest being very circuitous, and laid out in a succession of serpentine curves, on precipitous sidelong ground.

The clearing of the railway from bush and jungle was attended with considerable risk, having to be done two or three times over during the progress of the works, the growth of vegetation being so prolific here. Now that the line is completed and opened, the clearing is still a work of some expense, and has to be done twice a year by negroes, or the course of the line would be grown up and invisible. In the first attempts at clearing away the jungle, the pestilential insects were an insufferable nuisance to the men; and frequently have they been driven from their work before a cloud of mosquitoes, sand-flies, garropatas, and venomous tropical insects.

From the dismal swamp the railway winds its course tortuously, and in the shape of an almost succession of reversed curves, through the summit and all the way to Panama. These curves are reversed 4°, 6°, and 8°, (which is the American notation for curves of the respective radii of 1432, 955, and 716 feet,) without any straight line to ease the reversal, and not always with the outer rail elevated. The winding

course of the line may be conceived of from the fact that the isthmus in a direct line is only about 30 miles wide, but the distance by railway from Colon to Panama Bay is 48 miles. The course is very ingeniously picked out in the vicinity of the summit, taking every available ravine and opening to its assistance; running sidelong on the banks of the Chagres river in dangerous proximity for miles, and turning at times to every conceivable point of the compass, giving the traveler occasional views of tropical luxuriance; taking awful twists and bends to avoid cuttings of 8 or 10 feet in depth; and at last clearing the summit of the isthmus $10\frac{1}{2}$ miles from Panama and the Pacific, with a cutting only averaging about 20 feet in depth and 500 yards long. The greatest grades are 60 feet to a mile, the curves are anything you like, and the maximum elevation to which the locomotive ascends is 263 ft. above the mean tide levels of the two seas. Before the railway was explored and constructed, the isthmus had been surveyed by various scientific individuals, who maintained that a less summit could not be found at Panama than about 400 or 500 feet above the sea. But railway engineers soon destroyed the hypotheses of learned explorers (who so often write about nature, but do not attack her,) and by a good deal of pluck and energy, and a small amount of science, brought the project to a practical issue.

The isthmus presents many picturesque tropical beauties between the Aspinwall swamp and Panama. There are the varieties of palm trees, more than twenty in number, with their clusters of scarlet berries; the cocoa-nut tree with its graceful feathery branches; the gigantic flowering tropical lilies and cactus; the plaintain, prickly pear, and gay flowering shrubs and creepers; and the impenetrable jungle or tropical thicket, clothing the ravines with a dense cover of vegetation, and giving to their undulations a gorgeous clothing.

The earthworks upon the railway are but trifling; there are no large cuttings, (the largest being the summit one mentioned above,) and no very large banks. The bulk of the material for the banks was taken from patches of side cutting taken at the nearest and most convenient points, regardless alike of appearance or finish. Necessity was the order of the day, and style and order had to succumb. These slopes are not trimmed, or even formed at all like slopes, the cuttings being taken out vertically and allowed to form themselves, and they have formed themselves truly, with the assistance of the tropical rains, into very wild shapes. Nature, here so prolific, however, steps in frequently and clothes their deformities by a tropical covering of vegetation. The tops of the banks are shaved down in too many cases to a nicety, being not more than 10 or 12 feet broad at the top, and cut into and guttered up severely by the tropical rains, for want of a proper sodding. Near the summit this deficiency of embankment gives the line a very dangerous look, and especially so where its slopes are washed by the Chagres river. Diversions of the line and sacrifice of good alignment are visible in some places where work has been cut down to its minimum, and pushed through at any sacrifice.

The bridges which were first constructed upon the line were of the

true wooden, temporary, and American type, having a very stagy look about them, and not intended for inspection by posterity. They were in some cases nothing more than trestle-work of the rudest description, and quite unsafe for trains of more than four or five miles per hour. These, however, thanks to the rapacities of a tropical climate, have gone the way of all that is perishable, and crumbled into dust and tropical mildew. Wrought iron boiler plate girder bridges, both for large and small spans, resting upon stone abutments, have been substituted. They are of the simplest character, and have a lean, skeleton appearance. Each bridge is only composed of two ordinary girders, placed directly under each rail, with nothing over them but the common cross-sleepers of irregular lengths, and the rails then spiked to these. No planking, no parapets, (although the bridges are frequently placed on very ugly curves, and the train jumps as it mounts them,) and the bridges *in toto* resemble an ill-constructed gridiron. The masonry is bold, rough, and good, prepared from a blue granite and whitish freestone which are found on the line, in the execution of which negro labor, as in all other classes of work on the isthmus, is largely employed under white superintendence. These bridges have cost a heavy sum, as they have all been constructed on the wrecks of the old ones, since the opening of the line in 1854, and whilst the ordinary traffic has been going on. The iron bridge over the Chagres river, about half way across the isthmus, is the largest and most important work on the line; it has six openings of a hundred feet span each, spanned by as many pairs of boiler plate girders, arranged in this example to form the parapets, with small cross girders, and upon these last the longitudinal timbers are fixed to carry the rails. The whole, however, is left gridiron shape, without planking or finish. It is adapted for a single line only. The upper sides of main girders are curved, which gives to the upper lines of the bridge a wavy and unpleasing appearance.

The permanent way is of the roughest character; being laid and maintained by negro labor, its correctness as to line, level, and finish may be easily judged. The rails are, however, generally good, and of the bridge-rail section, weighing 68 lbs. to a yard. Some short distance of the line is laid with the common Yankee foot-rail, or, as it is sometimes termed in England, the contractor's rail. The rails are fastened to the intermediate sleepers by common spikes weighing less than a pound each, and at the joints are secured very roughly by a small boiler plate chair (8 lbs. weight) and four spikes. This is the universal American system of fixing rails. The rails might, however, have been slotted at one end, through which two of the spikes pass and secure the rail to the chair, and prevent it from sliding. The bridge rails used here were evidently intended for longitudinal timbers; for there are the holes in the flanches for the screw bolts which secure the rails to the continuous timbers. The sleepers now used are of lignum vitæ wood, fetched from Carthagena on the Atlantic side of the isthmus, and cost, when delivered, 6*s*. each. The sleepers originally used (pine) on the line have wholly disappeared; they only lasted from two

to three years. The lignum vitæ sleepers are reported to be of no longer duration than about twelve years. The ballast was omitted from the line almost entirely in its first formation, and now it is not universally used throughout, being put on in patches from time to time, where it is found to be all important to keep the permanent way from being washed out of position by the tropical rains. It is principally formed of broken rock and coarse gravel, both of which are plentiful on the line ; it is used sparingly, however, the sleepers being generally on the soft material on their underside, with broken rock packed between.

The traveling on the railroad is very slow, averaging not more than ten or twelve miles per hour. The grades, however, are not excessive, not exceeding as above stated a maximum of 60 feet in a mile ; but the locomotives are weak and asthmatic, and they frequently stick on these inclines with very ordinary trains, and the passengers sit under a broiling tropical sun at the bottom of a cutting, with only an inch board intervening between them and the sun, frequently for an hour together. This is not very pleasant when each passenger pays £5 3*s.* for the fare to cross the isthmus, and 6*d.* per pound for all his luggage over fifty pounds weight, which, with something like an ordinary amount of luggage, comes to about 2*s.* 6*d.* per mile per head. The black negro engine drivers too take a long time to pull up at an intermediate station, swinging backwards and forwards in its vicinity for about a quarter of an hour, like the pendulum of a clock. The locomotives and carriages are of United States build and fashion, only a shade worse. There is the bull-whistle to the locomotive, with its funny little wheels in front on a bogie frame, turning on a swivel-joint, and its broad-topped ugly funnel for wood-burning. The carriages are common and dirty, with no double casing to the top to screen the intense heat of a tropical sun, Venetian slides for windows, and hard seats. The station-houses along the line are mere palm huts (excepting at Aspinwall and Panama), and their vicinities have a wild uncivilized appearance, with the black, nude negroes hovering about in all the crudities of uncivilized life.

At Panama, the terminus of the line on the Pacific side, the station has no conveniences of any kind for travelers; no offices for washing, refreshment, and other purposes. The traveler from California to the United States often finds himself here in company with some 1000 or 1200 persons, just arrived by a Californian steamer, suffering from tropical disorders, and no means of comfort at hand, not even civility.

The total cost of the line has been about £27,000 per mile, and the engineer-in-chief from the commencement to the present time has been Colonel Totten, an American. The railway pays a dividend of 12 per cent. per annum, with its present undeveloped traffic.

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*The Railway Work of the Session.**

It appears from an official report issued by the Board of Trade that 192 railway and canal bills are now before Parliament. Of this number, 129 bills authorize new works. In England 61 bills have been

* From the London Mechanics' Magazine, Feb., 1859.

introduced by new companies seeking powers to construct 638 miles of railway; in Scotland five bills, referring to 53 miles, are brought forward by new companies; and in Ireland four bills, referring to 77 miles, are introduced in a similar manner. As regards the movements of existing companies, they have introduced 43 bills for 154 miles of new lines in England, six bills for 78 miles of new line in Scotland, and ten bills for 129 miles of new line in Ireland. The total length of new line proposed is, therefore, 1129 miles, and there are besides 95 miles of deviation lines, and twelve projects for the enlargement of stations.

On the Successful Working, by Locomotive Power, over Gradients of 1 in 17, *and Curves of* 300 *feet radius, on Inclines in America.** By Mr. T. S. Isaac.

[Read before the Institution of Civil Engineers, Nov. 23, 1858.]

It was stated, that the road which had decidedly taken the lead in the United States, in the application of locomotive power to steep gradients, and had been generally the pioneer of improvements, was that extending from Baltimore, on the Chesapeake Bay, to Wheeling on the Ohio river, a distance of three hundred and eighty miles, through a region of considerable difficulties, especially in the various ranges of the Alleghany Mountains. This Company was incorporated in 1827, being the first chartered in America, and a portion of the road was opened in May, 1830. At first it was worked by horses, but locomotives were employed as early as August, 1830,—prior to the opening of the Liverpool and Manchester Railway. It was not until 1851 that the great incline over the main range of the Alleghanies was completed and worked by locomotives. It had an inclination of 1 in 45½ for 11 continuous miles, and, after winding amongst the summits of the mountains for twenty miles, it descended, on the western side, with an inclination of 1 in 45½ for nine continuous miles. The passage of this mountain chain involved altogether sixty miles of railway, twenty miles of which had a gradient of 1 in 45½, and nine miles of 1 in 50, both worked by locomotive power, at a speed of from fifteen to twenty miles per hour for passenger trains, and from ten to fifteen miles per hour for goods trains. The curves were frequently 600 feet radius. Although it was one of the main thoroughfares of American commerce, no extra provision was made for working these inclines, beyond incresing the number of the engines. The engines had eight wheels, all coupled, the diameters of the cylinders being 17 inches, the length of the stroke 2 feet, and the diameter of the wheels 4½ feet. The engines weighed 24 tons each, and the tenders 13 tons each.

In 1852 difficulties were encountered at two different tunnels, which rendered temporary inclines necessary, in order to accomplish the passage of the trains. This system was frequently adopted when it was required to surmount hills where the tunnels were incomplete, in order to enable the iron and other materials for the permanent way to be

* From the London Mechanics' Magazine, December, 1858.

delivered along the line. There was a maximum gradient over the Kingwood tunnel of 1 in 10, and this incline was in operation for several months, the iron and other materials for upwards of forty miles of line, and the United States mails have been conveyed over it by locomotive power. The same engine that was used on the other parts of the line was employed, and it drew a loaded car weighing 13 tons, and a tender weighing 12 tons, or a total weight of 25 tons, at the speed of 8 to 10 miles per hour. Over the Board Tree tunnel there was a series of zigzag inclines, on which the upward motion of the train was alternately reversed, the engine at one time pulling, and at another pushing the cars. There were three of these inclines on the Eastern, and five on the Western slope of the hill. The total length was nearly two miles and one-third, and the gradients varied from 1 in 18 to 1 in $15\frac{1}{2}$, with a minimum radius of curvature of 300 feet. The ordinary freight consisted of two loaded cars, weighing, together with the tender, 37 tons. Mr. Latrobe, the chief engineer of the line, said, in his report for 1853, that as many as fifty cars, containing 400 tons, and two passenger trains, had been taken over this hill in a day by four first-class locomotives; and that, during five months, there had been no accident involving more than a trifling detention. These two inclines, although unprovided with engines especially adapted for the purpose, fully demonstrated the feasibility of traversing gradients, altogether unprecedented, by the locomotive alone. The experience gained in working them not only established the fact, that a rise of 300 feet per mile, and curves of 300 feet radius, could be worked with comparative facility, but seemed to point also to a limiting gradient, beyond which it was impossible for the locomotive to go, with any useful effect, even for a temporary purpose.

Steep gradients and sharp curves had since been adopted on the Virginia Central Railroad, on a more extended scale, and had been in successful operation for upwards of four years. The Mountain Top incline on this road crossed the Blue Ridge Mountains at Rock Fish Gap, in Virginia. This incline was fully described at p. 245 of the 66th vol. of the *Mechanics' Magazine*.*

The author believed that the resistance of the curves had been underrated in America. On the Mountain Top incline it was proved that the resistance of the curve exceeded $25\frac{1}{2}$ lbs. per ton of engine and train. Mr. Latrobe had calculated that the resistance to traction, on a level, was doubled by a curve of 400 feet radius; and he assumed 13 lbs. per ton as the additional friction of the train, on a curve of 300 feet radius, whence the additional friction of the engine, due to such a curve, must have exceeded 49 lbs. per ton of its own weight. Two expedients had been resorted to for diminishing this friction. On the Baltimore and Ohio incline, for a speed of ten miles per hour, the outer rail had been gradually raised, on a curve of 300 feet radius, from 2 inches, the height given by the ordinary formula, to 9 inches. On the Mountain Top Track inclines, for a speed of 8 miles per hour, the outer rail had an elevation of $6\frac{1}{2}$ inches; and a sponge, saturated with oil, was kept in contact with the flanches of the two forward wheels

* See Journal of the Franklin Institute, Vol. xxxiii., p. 217.

of each engine. These expedients had so far reduced the friction on the latter road, as to cause no perceptible diminution of speed on leaving a straight portion of the track, with a gradient of 296 feet per mile, and entering a curve of a radius of 300 feet, having a gradient of 238 feet per mile.

The Virginia Central Company had also constructed a shorter incline, about 100 miles further west, which was one mile and-a-half in length, with gradients varying from 250 to 300 feet per mile, and curves of a minimum radius of 400 feet. Over this incline, which had been in successful operation for two years, the common freight engines, on eight wheels, four of which were coupled, giving 16 tons for adhesion, had taken a load of 36 tons, at a speed of five miles per hour.

The ordinary performances of the engines on the Mountain Top Track, showed an exertion of $181\frac{1}{2}$ horse power, including the engine in the load, or 118 horse power not including the engine; giving, in the latter case, 4·8 horse power per ton of motor, the resistance due to the speed and the gradient being 121·64 pounds per ton.

On one or two occasions, on the incline of 1 in 10, on the Baltimore and Ohio line, the weight of the engine being four and three-quarter times the resistance of gravity and the friction of the load, when the rails were very greasy, the engine and train slid backwards with locked wheels, from near the top to the bottom of this incline, without damage. The wheels of these engines had chilled tyres, a circumstance which considerably decreased their adhesion. The engines on the Mountain Top Track, with an ordinary train, exercised an adhesive power of one-sixth of their weight, and this could always be maintained, in the severest weather, by the use of a fine clean sand.

In conclusion, the author remarked, that there were probably few mountain passes that could not be overcome by the introduction of gradients of 1 in 17, and experience had satisfactorily proved, that the locomotive could draw a load nearly double its own weight up such a gradient, at a speed of eight miles per hour. The working of the Mountain Top Track furnished additional evidence to that already gained from other sources, of the superiority of light engines with light loads, over heavy engines with heavy loads.

(To be Continued.)

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*Fall of Stone Staircase at the Polytechnic Institution.**

Late on Monday evening last, (Jan. 3d, 1859,) at this Institution, a very deplorable event occurred, resulting in the death of one person, and serious injuries to six others, of whom three can hardly be expected to survive, besides more or less wounding some twenty other persons. It appears that after about 800 of the audience had left the building, the staircase (on the left-hand going in), well known to most of our readers, was being descended by the remainder of the thirty or forty lingerers, who always wait to see the complete exhibition, when

* From the London Builder, Nos. 831 and 834.

those upon the middle flight were hurled to the bottom of the well of the staircase by the fall of that flight of steps on to one below it, carrying the under one also into the basement. The immediate assistance of police force and the officials of the Institution saved the surviving sufferers, almost all females, from the immediate perils of their position.

Pending the coroner's investigation, we shall abstain from any comments upon this additional disaster in the midst of the festivity of the new year, in order that no injustice may be done by casting blame in wrong quarters.

The steps are of Portland stone, feather-edged, and were put up twenty years ago, under the direction of Mr. James Thomson, the architect of the building. Not long ago the treads having become worn, open iron work, the interstices filled in with cement, was let in on the face of them, and it has been urged by some that cutting into the steps for this purpose has led to the calamity. The iron facing on each step weighs about 1 cwt. Each step probably weighs $2\frac{1}{2}$ cwt. On the other hand, it is stated that the fall commenced at the upper landing, and that it has been found that the joggle here was not soundly made.

The appearance presented by the staircase is most extraordinary; every step being broken sharply off about 4 inches from the wall. The accident will not fail to inspire the gravest considerations.

A jury, under Mr. Wakley, coroner, met on Thursday morning last, and, after viewing the body, adjourned for a week, to enable two architects, unconnected with the establishment, to examine and report on the cause of the accident.

On Monday last, (Jan. 24,) the inquest on the death of the girl killed by the falling of the staircase at the Polytechnic Institution, was resumed; and, after a discussion as to the propriety of taking further evidence including that of the architect of the building and alterations, the coroner summed up, and the jury found a verdict of "accidental death," also expressing belief that the fall "was occasioned by the cutting for the insertion of the iron trellis-work and brackets, and by the incautious manner of doing the work." They further added, that they could not allow the opportunity to pass "without expressing in the strongest manner their opinion that all public buildings should be subject to a periodical inspection." A competent person, appointed by the Government, should certify to some office, prior to the granting of a license for a building intended for public assemblage, that such buildings had been erected and finished in all its parts in a manner suitable to the purpose; and the like inspection, certificate, and license, should be necessary upon occasion of all alterations or repairs of importance. The jury also strongly objected "to the almost irresponsible power now vested in the hands of companies and individuals in the erection and maintenance of our public places of resort," and wished "to impress upon the Government the absolute necessity of not allowing the ensuing session of Parliament to pass without some enactment to enforce these suggestions." Such a course they "deemed imperative to

allay the fears of the public, in consequence of the accidents that have so frequently taken place," and hoped the coroner would forward the suggestions to the Secretary of State.

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*Stone Stairs.** By Richald R. Brash.

The late disastrous accident at the Polytechnic reminds me of a similar one which occurred in the Commercial Buildings of this city (Cork) two years since, but happily without loss of life. The staircase leading from the vestibule to the great hall suddenly fell, the Portland stone steps breaking off within four or five inches of the wall into which their ends had been inserted.

These steps had undergone a similar process to those at the Polytechnic, having had plates of cast iron inserted in the edges of the treads, about $4\frac{1}{2}$ inches wide. As they had previously been somewhat worn, these plates extended to within 5 inches of the wall bearing, and every step broke at the end of the plate.

Architects should be very careful in the selection of the material for the staircases of public buildings; and people generally should be very careful in meddling with them when once up.

It is a singular fact, that in the latter instance no person was on the staircase when it fell, though some few weeks previously it had been loaded to its utmost capacity.

* From the London Builder, No. 832.

AMERICAN PATENTS.

List of American Patents which issued from February 22, to March 28, 1859, (inclusive,) with Exemplifications.

FEBRUARY 22.

231. Method of Operating Reciprocating Saws; T. J. Alexander, Westerville, Ohio.

Claim—Reciprocating the saw by means of right and left hand rocking levers or drivers, jointed to, or otherwise connected with, the saw, when said levers are separately hung or pivoted and geared together for reverse action, and so arranged as to admit of being worked by the hands of the operator.

232. Preparation of Artificial Fuel; Henry Adolphe Archerau, Paris, France; patented in France, August 11, 1856.

Claim—Producing artificial fuel by stirring, mixing, or incorporating coal dust or small coal, peat, turf, lignite, or other combustible substances, with rosin, pitch, tar, or other resinous, bituminous, or carbonaceous matters or substances, in any suitable proportions, according to the nature of the materials employed, and by causing steam, hot air, or gases, to pass through the mass during the stirring or mixing operation, or while the carbonaceous and bituminous particles are in motion. Also, mixing vulcanized carbonaceous matter with melted pitch, tar, or other bituminous substances, when the latter are worked up into a frothy state.

233. Apparatus for Destructive Distillation; Luther Atwood, Brooklyn, New York.

Claim—The arrangement and combination of the combustion tower, distilling tower, and steam blast, or their equivalents, in combination.

234. Machine for Jointing Staves; Henry Benter, Wheeling, Virginia.

Claim—1st, The carriage, provided with rollers, and used in connexion with the adjustable guides and rotating cutter head. 2d, The adjustable plate in connexion with the stationary jaw and sliding jaw, attached to the carriage.

235. Measuring Faucet; Edmund Bigelow, Springfield, Massachusetts.

Claim—A self-measuring faucet, whose supply valve is closed and discharge valve opened by a single movement, and whose discharge valve is closed and supply valve opened by a single movement produced by a spring, and which is supplied with a vent pipe for letting out the air, and another vent pipe for letting in the air when the faucet is to be discharged, which last vent pipe is shut off when the faucet is to be filled or is standing full.

236. Casting Stereotype Plates; Wm. Blanchard, Washington City, D. C.

Claim—Casting stereotype plates for printing by immersing a metallic mould plate, with a mould or matrix formed upon and adhering to it. Also, the manner of casting any number of stereotype plates by immer-

sion, or otherwise, in which each mould plate holds, on one of its sides, a matrix, whereon the face of the stereotype plate is cast in one compartment, while its reverse side, in any compartment, is used as a matrix whereon to cast the back of another stereotype plate.

237. Propeller for Canals; Benjamin Burling, Buffalo, New York.

Claim—Propelling canal boats, or other craft, by means of a steam tug placed within a well hole at the stern, and connected therewith by the shackle and stancheons, or their equivalents.

238. Water Wheel; N. F. Burnham, Laurel Factory, Maryland.

Claim—1st, The concave hub, in combination with the bucket which forms the wheel. 2d, The chutes or guides, in combination with the wheel by which one-fourth, one-half, three-fourths, or all the water, can be admitted to the wheel, and in each case get the same per centage from the amount of water used.

239. Machine for Bending Wood; Alonzo Chubb, Painesville, Ohio.

Claim—1st, The combination and arrangement of the strap with the guides, in the manner set forth. 2d, Making the guides adjustable by the use of the slots therein, and of corresponding ones in the bed timbers.

240. Triangular Stand for Furniture; Thomas W. Currier, Lawrence, Massachusetts.

Claim—The arrangement of the triangular plates with legs on the axle, as specified.

241. Vegetable Cutter; Wm. C. Davol, Fall River, Massachusetts.

Claim—The bed-plate, having the hopper attached, provided with the follower, the vibrating plate lever provided with the double-edged knife and hook and attached to the bed-plate.

242. Boot-jack; Henry N. Degraw, Green Island, New York.

Claim—The arrangement of a guide piece for the purpose of operating the jaws, in combination with a swinging platform, which rests on pivots at points between its front and back ends, so that it can be operated by throwing more or less weight on the heel or on the toes of the foot placed on the same.

243. Meat Cutter; Benneville Dewalt and Charles E. Schrader, Reading, Pennsylvania.

Claim—The arrangement of the knives in a screw form in different directions from the ends of the cylinder to the centre thereof, to discharge the meat at the adjustable opening in the bottom.

244. Cricket Bats; M. Doherty, Boston, Massachusetts.

Claim—1st, Constructing the blade of the bat of a wooden shell with a filling of cork, or other materials. 2d, Constructing the handle of the bat of a wooden tube with a central strip of whalebone, or other elastic material of similar character, running down into the blade.

245. Machine for Bending and Setting Springs; John Evans, New Haven, Connecticut.

Claim—1st, The adjustable or sectional bed, formed of the bars connected to the weights, and arranged as specified. 2d, The adjustable clamps or straighteners formed of the strips placed on rails or bars. 3d, The adjustable or sectional bed formed of the bars, and the adjustable clamps or straighteners, formed of the strips placed on the rails, in combination with the adjustable dies.

246. Pump; James L. Fagan, Anaqua, Texas.

Claim—The cylinder and hollow shaft, connecting with each other and having a reciprocating partially rotating movement, when said cylinder is perforated and provided with valves, and also provided with the piston, and with the stationary plate fitted within it.

247. Coffee Pots; James H. Freeto, Wheaton, Illinois.

Claim—The arrangement of valves in the condensing chamber in connexion with the pipes, whereby the steam which escapes through the valve is carried off and deposited in a liquid state into the spout, while at the same time, by the action of the steam, a jet of cold water is admitted into the chamber. Also, closing the opening through which the spout communicates with the coffee pot, by means of a flat valve which is operated by a rod, when the same is applied to a coffee pot which is hermetically closed by a gasket, in connexion with the air tube.

248. Moulding Covers of Cook Stoves; George W. Gardener, Troy, New York.

Claim—Combining with that part of the pattern which gives form to the recess of the cover, the pivoted projections.

249. Ploughs; John M. Hall, Warrenton, Georgia.

Claim—The arrangement of the adjustable coulter bar, point, holes, shoe, mould-board, adjustable screw bolt, attachment, pins, key, bolts, and slot in beam, as described.

250. Clothes Rack; Winfield S. Foster, Marilla, New York.

Claim—The combination of the rods and heads with the side pieces of the expanding clothes rack, in the manner specified.

251. Plough Beams; John S. Hall, Manchester, Pennsylvania.

Claim—An iron or steel plough beam, of an inverted U form throughout its main length, and welded or compressed at its ends, and so made as to be capable of receiving the top of the standard into its hollow portion, and be otherwise conveniently connected to or with the other portions of the plough, and so as to make a cheap and efficient junction of the several parts thereof, and produce a cheap, strong, and durable plough beam.

252. Machine for Cutting Straw and Hay; W. O. Hickok, Harrisburgh, Pennsylvania.

Claim—The arrangement, in combination with the upper or yielding feed roller and the cutter shaft of the coupling lever, when the said lever connects the said feed roller with the cutter shaft, by having its fulcrum around the said shaft, and also carries the pinion, which connects the pinion of the shaft with the spur-wheel of the near journals of the feed roller, the journals of the said feed roller working in grooves which are curved, so as to be concentric with the said cutter shaft.

253. Railroad Splice for Railroad Track Bars; Charles Hilton, Albany, New York.

Claim—Deep wrought iron fish-plates secured to the sides of the rails by bolts or keys, and extending downward below the base of the rail, in combination with the gib and wedge.

254. Horse and Ox Shoes; N. E. Hinds, Cooperstown, New York.

Claim—The curved or semicircular form of the heel calks, with the corners thereof turned inwards or towards the central part of the shoe.

255. FOUNTAIN BRUSHES; L. B. Hoit, City of New York.

Claim—A marking brush, consisting of a cistern which is provided with a stationary valve, and having the brush attached to a conical tube which fits into a shell.

256. HARVESTERS; Moses G. Hubbard, Penn Yan, New York.

Claim—The combination of the curved portion of the finger bar hinged at a, with the spring, forming a yielding and elastic corner or point of attachment of sufficient strength to securely connect the cutting apparatus thereto. Also, the auxiliary adjustable spring, or its equivalent, as described.

257. STEAM BOILERS; Edward Kendall, Cambridgeport, Massachusetts.

Claim—1st, The arrangement of the water walls, the suspended water spaces, flues, fire-box, lower and upper smoke boxes, and tubes, within the shell of the boiler, as set forth. 2d, In combination with the described arrangement of water spaces and heating surfaces, the arrangement of the hollow fire-bridge, the pipes, the cylinder, and pipes. 3d, The arrangement of the passages for the gaseous products of combustion, the exhaust steam, and the air in the air-heater, as set forth.

258. PACKING BAR LEAD; Zebulon Kinsey, Dubuque, Iowa.

Claim—The use of the bar or bolt when inserted in perforations made in bars or ingots, and clenched or fastened in the manner described.

259. STEAM PRESSURE GAUGE; Thomas W. Lane, Meredith, New Hampshire.

Claim—1st, So combining the indicating tube with the pipe through which the pressure within the boiler is transmitted to the gauge, that the length of tube in either direction from its junction with the pipe shall not exceed a semicircle, and placing the tube in such a position that it shall descend at every point towards its junction with and drain back into the pipe. 2d, Joining the pipe from the boiler with the indicating tube at a point between its two ends, and bending the latter so that the ends of the tube shall be nearly over the points where its two branches are rigidly supported, whereby the tube is rendered less sensitive to the vertical shocks to which it is subjected. 3d, Bending the two portions of the indicating tube symmetrically, or nearly so, upon opposite sides of a vertical line, and connecting the two extremities of the tube with the lever, for the purpose of preventing the horizontal vibrations of the tube from being transmitted to the index hand. 4th, Pivoting the lever to the indicating tube without attachment to the case.

260. HOSE COUPLING; Robert B. Lawton and W. H. Bliss, Newport, Rhode Island.

Claim—The thimbles, C D, being provided with the shoulder and ground seat or packing, and the thimble, D, provided with the groove with inclined sides and fitted within thimble, C, the above parts being used in connexion with the conical roller or rollers fitted in the screw caps.

261. FIRE-PLUGS; Joseph L. Lowry, Pittsburgh, Pennsylvania.

Claim—Making a single chamber serve the purpose of a cross-pipe, when each main leading into said chamber is furnished with its own stop-cock, and access is had to each stop-cock through said chamber for repairs, &c., thus making one chamber and one cover common to two, three, four, or more mains. Also, arranging the fire-plug immediately over the chamber, for the purpose of effecting a circulation of the water in the pipe between the main and the fire-plug, to prevent its freezing. Also, in combination with the valve and its wing, the hollow set-screws for wasting the water from the fire-plug when said valve is closed. Also, the removable gasket in the ends of the branches or bowls, so as to renew the seats for the valves when necessary, without disturbing the main or stop-cock, access to these gaskets being through the common chamber.

262. WATCH CASES; Louis Mabille, City of New York.

Claim—The construction of the case with the front plate fitted to the ring or frame, with a projecting rim and bevel all the way round, when combined with an internal cavity in the back to receive and contain the said plate, when removed from the front.

263. CURTAIN LOCK FOR CARRIAGES; Samuel Marshall, Wilmington, Delaware.

Claim—The employment of the two metal plates, in combination with the button and button-hole of the carriage and curtain, and with the spring fastening.

264. WATER GAUGE FOR STEAM BOILERS; Alexander Miller, Cleveland, Ohio.

Claim—Operating the valve of an alarm gauge to produce the alarm when necessary, by means of a cam or wiper on a valve stem, and a stationary inclined projection on the socket or tube, or its equivalent, the several parts being arranged and applied in combination with a float attached to the stem.

265. CORRUGATED IRON PAVEMENTS; James Montgomery, City of New York.

Claim—1st, The arrangement and combination of the unequal ribs or corrugations, for the purposes set forth. 2d, The described form and application of the laterally projecting spurs, for the purposes explained. 3d, The dovetailed groove shown, applied to metallic paving, and employed to retain within it concrete and other matter.

266. GRAIN SEPARATORS; Henry Montgomery and Simeon Howes, Silver Creek, New York.

Claim—The aperture, U, when situated immediately below the inclined board, and in combination therewith, for the purposes specified.

267. LOCKS; L. F. Munger, Rochester, New York.

Claim—The arrangement and combination of the knob with the tumblers and bolt, the said knob having studs out of the line with each other, one stud being in line with the bolt, and the other stud being in line with the tumblers, so that when the key is inserted, one of the studs shall pass by the tumbler, while the bolt is shot out by the other studs, and when the key is withdrawn and the knob reversed, the stud shall lift the tumblers and thus prevent the picking of the lock by the insertion of a key.

268. SCREW-PLATE; Putnam D. Nichols, Hartford, Connecticut.

Claim—The adjusting steady pins and set-screws, with the sliding plate attached to the regulating rod and screw, in combination with the method of adjusting and regulating the dies for operation.

269. BROOCHES, EAR-RINGS, &c.; Henry Oliver, Philadelphia, Pennsylvania.

Claim—Photographic or sun-pictures upon concave surfaces of glass, and backing them up with cement, in the manner specified.

270. BLIND FASTENING; Rufus Porter, Washington City, D. C.

Claim—The combination of the lateral catches with the elevated finger socket, the whole consisting of a single plate, which is so formed, that while the catch end thereof is horizontal, and constitutes right and left catches, and is connected to the bottom of the shutter, the opposite end is vertical, and is connected to the face

of the shutter at some distance above the bottom thereof, and constitutes a finger socket or hook near the hinged edge of the shutter, to be drawn back by a finger for the purpose of unfastening the shutter, when open, and closing the same.

271. Lamps; Charles W. Richter, Sr., Madison, Georgia.

Claim—The combination of chamber and tubes with the non-conducting medium above plate. Also, the manner of moving the wick within the tube, in combination with the construction described.

272. Stalls for Horses on Shipboard; Samuel Samuels, Brooklyn, New York.

Claim—Suspending a horse-box on board of a ship or other vessel, on pivots or centres, having their axes arranged transversely to the box, and parallel or thereabouts with the length of the vessel. Also, combining a series of two or more so-suspended boxes, as described.

273. Seal-presses; Joseph Saxton, Washington City, D. C.

Claim—1st, A sealing-press, operated by a lever, to which the stamp is attached by an adjustable joint, the whole being adapted to the purpose of sealing with fusible metal or alloy. 2d, The guard for retaining the excess of metal driven off from the seal, in the act of making the impression.

274. Curtain Fixtures; Henry C. Spalding, Brooklyn, New York.

Claim—1st, The narrow rim, in combination with a roller having end play. 2d, The combination of the roller, flanch, and cord. 3d, The combination of the two hangers with the roller, the cord, and the rack, constructed as described.

275. Treadle-stand; Henry C. Spalding, Brooklyn, New York.

Claim—A self-sustaining skeleton treadle-frame, composed of sections secured together at right-angles, so that the frame is self-braced crosswise and lengthwise with the table which it supports.

276. Apparatus for Ventilating Railroad Cars; Robert Taylor, Reading, Pennsylvania.

Claim—The blowing cylinder hung to one of the trucks of the car, and operated from one of the axles by means of an eccentric, or other equivalent device, in combination with the flexible or self-accommodating inlet and discharge pipes, and the distributing pipes, arranged as set forth.

277. Chuck for Watchmakers' Lathes; G. H. Waldin, Burlington, Iowa.

Claim—The use of the cylindrical core or spindle, in connexion with the thimble for containing sealing-wax, or its equivalent.

278. Cementing Roofs; J. L. G. Ward, Adrian, Michigan.

Claim—The covering of roofs of buildings by laying bricks, or tiles, or slabs of other material, in a bed of cement consisting of an alkaline silicate, and subsequently treating the surface of said cement with an acid which combines with the alkaline thereof, and leaves a surface of pure silica.

279. Pessaries; Francis F. Wells, Texana, Texas.

Claim—The combination with the ring of the hinge-jointed and slotted standing supports and their stem, the hinged sliding support, the hinged arm, the collar, or its equivalent, and the plate.

280. Apparatus for Handling Hides; Charles Weston, Salem, Massachusetts.

Claim—The apparatus for keeping hides in motion while exposed to the action of the tanning liquid, the same consisting of parts constructed and arranged in relation to each other, as described.

281. Feeding Mechanism for Sawing Machines; Philip P. Weis and F. Schutte, Philadelphia, Pennsylvania.

Claim—The adjustable frame with its rollers, the pressure frame with its rollers, and the feeding screws, in combination.

282. Key-bolt for Attaching Carriage Thills; G. P. Wilhelm, Bridgeport, Pennsylvania.

Claim—The manner described of fastening shafts and poles to carriages by the arrangement of the bolt, spiral spring, and clips.

283. Harvesters, Walter A. Wood, Hoosick Falls, New York.

Claim—Connecting the bent bar to the axle, and allowing its other end free vertical motion between guides. Also, in combination with the bent bar for sustaining the finger end and cutter bars, the continuation of the finger bar and its attachment to the main frame, in the manner set forth.

284. Mowing Machines; Walter A. Wood, Hoosick Falls, New York.

Claim—Connecting the bent bar that carries the finger and cutter bar to the main frame by the spring plate, and to the axle by the loop, so that the finger bar may rise and fall independently of the wheel or main frame, or the main frame independently of the finger bar.

285. Machines for Corking Bottles; Lewis L. Chichester, City of New York, Assignor to David L. Winthringham, Jersey City, New Jersey.

Claim—The toggles, frame, and bar, provided with the plungers, in connexion with an adjustable bottle-stand and bar provided with the tubes. Further, the particular manner of adjusting the bottle-stand, to wit: attaching the same to the frame by means of the lever, bar, arms, cross-bars, and plates, as described.

286. Catamenial Bandages; Charles E. Clark, Assignor to self and George W. Clark, Boston, Massachusetts.

Claim—My improved manufacture of menstrual receiver, as made of two inflatable, water-proof, crescentic-shaped vessels, united by a water-proof system, and arranged together and with the septum, and provided with means of supplying them with air, and discharging it therefrom.

287. Electro-magnetic Fire Alarm Apparatus; Moses G. Farmer, Salem, Assignor to William F. Channing, Boston, Massachusetts.

Claim—The combination of two or more key-boards or fire alarm strikers with one or more electro-telegraphic alarm machines, in the same closed electric circuit or independent closed electric circuits, by means of a mechanism that will make and break a circuit, as described.

288. Railroad Car Seats and Couches; Jonathan Good, Assignor to self and B. L. H. Dabbs, Philadelphia, Pennsylvania.

Claim—The arrangement and combination of the pivoted horizontally and vertically moving plate, curved ratchet plates, rack extension, and pinion, as described.

289. Straw Cutters; Wm. Hinds, Assignor to Jerome Hinds, Little Falls, New York.

Claim—The arrangement of the cutters, c c, in combination with the cutter, n, constructed substantially as set forth.

290. Machine for Finishing Carboys; Lyman Hyde, Assignor to the Ellinville Glass Co., Ellinville, N. Y.

Claim—The shears, treadle, or its equivalent, mandrel, and furnace, placed within a suitable frame, and arranged as set forth.

291. Bed-bottom; A. W. Morse, Assignor to self and R. B. Robie, Eaton, New York.

Claim—The combination and arrangement of the rods, gear wheels, staples, pins, wires, or their equivalents, lever, ratchet roller, and pawl, for the purpose of giving the proper tension lengthways and sideways simultaneously.

292. Blacking; L. R. Rockwood, Assignor to J. L. Clough, Worcester, Massachusetts.

Claim—Edge blacking, when composed of the mentioned materials, in the proportion and manner described.

Additional Improvements.

1. Shingle Machines; James Crary, Middleport, Ohio; patented November 24, 1857; re-issued Sept. 28, 1858; additional dated February 1, 1859.

Claim—1st, The use of the bridles or guide, in combination with wrists of the shaving knives, and the conveying grooves and vertical slots, for the purpose of communicating to the shaving knives a combined drawing knife and approximating motion during the process of shaving the shingles. 2d, The use of the spring check-plate, in combination with the movable gate, to permit one only at a time of the shingle bolts to pass to the shaving knives, and prevent the bolt being drawn back on the retrocession of the feed-board. 3d, The use of a feed-board composed of elastic bars or fingers, each capable of a slight depression at its extremity, so as to accommodate the surfaces of the feed-board to any unevenness or twist in the shingle bolt.

2. Reciprocating Saws; Carlyle Whipple, Cleveland, Ohio; patented January 13, 1857; additional dated Feb. 1, 1859.

Claim—The adjustable ways and the friction wheels, arranged in the manner specified. Also, the vibrating beams, in combination with the ways and their dependent parts, constructed in the manner set forth.

3. Machine for Trimming the Edges of Paper-hangings; John Waugh, Elmira, New York; patented Oct. 5, 1858; additional dated February 15, 1859.

Claim—The framed ways moving in a curvilinear path on a centre at one angle of frame; the hand lever that operates on frame way, and the springs which keep the frame in position, in combination for the purposes set forth.

4. Spring Bed-bottoms; Henry F. Smith, Washington City, D. C.; patented October 6, 1857; additional dated February 22, 1859.

Claim—The supporting the fixed end of the longitudinal slats in spring bottom bedsteads, by means of longitudinal spring bars, so that the elasticity or yielding of both ends of the slats may be equalized.

Re-Issues.

1. Revolving Fire Arms; Josiah Ells, Pittsburgh, Penna.; patented April 25, 1854; re-issued Feb. 1, 1859.

Claim—1st, The combination of revolving breech and stationary barrel with a lock, so constructed, as that the trigger used to fire the pistol when drawn back raises the hammer to full cock, and there holds it; the revolving breech being at the same time rotated as far as to bring one of the chambers in a direct line with the bore of the barrel, and fastened in that position preparatory to firing the piece, in the manner described. 2d, The peculiar arrangement of the parts of my lock, whereby, as the trigger is drawn back to raise the hammer, the heel of the hammer on the point against which the main spring bears, is brought so nearly under the centre of motion of the hammer, that the force of the main-spring is counterbalanced by the pressure of the trigger on the toe of the hammer, and thus it will stand at full cock or may be fired at once, as may be desired. 3d, The use of the tubular extension on the fore part of the rotating breech, extending beyond and underneath the breech end of the stationary barrel, through which tubular extension the end of the spindle projects, and into which the spindle fits closely, for the purpose of preventing the fouling of the spindle by the residuum of the smoke in firing. 4th, The use of a collar at the end of the tubular extension, for the purpose of forming, in combination with the spindle, a locking connexion between the revolving breech and the stationary barrel, which is furnished with a corresponding recess for the reception of the collar. 5th, Forming that part of the spindle which enters the bore of the rotating breech of smaller diameter at the front extremity than at the end where it locks, but by reducing its diameter suddenly, so as to form a step or shoulder at one or more points within the rotating breech, having a bore of correspondingly diminished diameter for the double purpose of sustaining the recoil of the breech in firing, and of aiding to prevent the fouling of the spindle by presenting an obstruction to the passage of the smoke between the spindle and the surface of the bore of the rotating breech. 6th, Connecting and locking the barrel and breech to the lock-plate, by means of a bracket and spring extending in front of the lock-plate, in the manner described.

2. Vault Lights; Thaddeus Hyatt, City of New York; patented Sept. 19, 1854; re-issued February 1, 1859.

Claim—In the construction of illuminating vault covers, the open frame with its large aperture or apertures closed with glass, in combination with the protection grating.

3. Devices for Putting up Caustic Alkalies; George Thompson, East Tarentum, Pennsylvania; patented October 18, 1856; re-issued February 1, 1859.

Claim—The putting up of the caustic alkalies of soda and potassa in small quantities in air-tight wrappings, cases, or boxes, in the manner described, or its equivalent, for the purpose of introducing into general use for domestic and other purposes these articles, which, owing to their peculiar chemical properties, have not heretofore been susceptible of general use in small quantities.

4. Improved Steam Valve; George Rieseck, Pittsburgh, Pennsylvania; patented August 15, 1858; re-issued February 8, 1859.

Claim—1st, The valve, with a projecting hollow stem, which is reduced so that its ends present an area only equal, or nearly so, to the receiving ports in the face of the valve, in combination with the main steam chest or chamber, and an auxiliary steam chest or casing, furnished with a stuffing-box, and constructed so as to cover the whole of the valve, excepting the end of the stem or a portion of the back equal, or nearly equal, to the receiving ports in its face. 2d, In combination with the above, the peculiar manner specified of making the face of the valve with six ports, three for receiving and three for exhausting, said ports being arranged in such relation to each other that when the valve is applied to an oscillating engine, one receiving port always stands in line with the exhaust port, and that only four of the ports shall be in use when the engine is working, the other two being kept in reserve, so that by shifting the valve the engine will be instantaneously reversed under a full pressure of steam, without shutting off the steam between the engine and the boiler.

5. Machine for Threading Bolts; Wm. Sellers, Philadelphia, Pennsylvania; patented December 1, 1857; re-issued February 8, 1859.

Claim—The use of rotating dies, in combination with cams, or their equivalents, when both are so arranged as to be capable of revolving about a common centre at different velocities, for the purpose of opening and closing the dies. Also, the arrangement of cams with the open spaces between them, in combination with the die-box and dies, to facilitate the changing of the dies. Also, the mode of attaching the top-holder to the revolving die-box.

6. Boxes for Preserving Alkalies; George Thompson, East Tarentum, Pennsylvania; patented September 15, 1857; re-issued February 8, 1859.

Claim—The use of metallic boxes, constructed as described, and united with cement infusible at the degree of heat at which the caustic alkalies of soda and potassa remain fluid, for the purpose of putting up those caustic alkalies in small quantities.

7. Self-dumping Coal Bucket; John Wust, Philadelphia, Pennsylvania; patented July 13, 1858; re-issued February 8, 1859.

Claim—The combination of a bucket suspended by the handle at points below its centre of gravity, in combination with a self-acting detachable latch operated by the bucket touching the ground.

8. Lamps; Wm. W. Batchelder, City of New York; patented December 28, 1858; re-issued Feb. 8, 1859.

Claim—The arrangement of small tapers or wick tubes below and on both sides of the main or illuminating burner, in combination with a suitable cap, for the purpose of producing a more complete combination.

9. Machine for Folding Paper; S. T. Bacon, Boston, Assignee of E. N. Smith, Springfield, Massachusetts; patented May 17, 1858; re-issued February 8, 1859.

Claim—1st, The employment of adjustable points or register pins, or their equivalents, for the purpose of correctly presenting printed sheets to a paper-folding machine. 2d, The combination of a registering apparatus with a paper-folding machine. 3d, The combination of the register pins with the fingers, reciprocating carriage, and slotted bar. 4th, The combination of the slotted reciprocating carriage with the knife. 5th, The combination of the slotted reciprocating carriage with the first pair of folding rolls and knife. 6th, The combination of a folding knife, the edge of which is smooth, with one or more needle points projecting beyond and in a line with the edge thereof. 7th, Securing the needle point or points to the folding knife, in such a manner as that they shall have their main support back of the edge of said knife. 8th, So constructing paper-folding machines, as that the sheet while being folded shall occupy the same time, or nearly so, while passing from the position for receiving its first folds to that of the next and succeeding folds.

10. Machine for Folding Paper; Steuben T. Bacon, Boston, Mass., Assignee through mesne-assignment of John North, Middleton, Connecticut; patented April 15, 1856; re-issued July 27, 1858; re-re-issued February 8, 1859.

Claim—The use of a stationary folding-knife in a machine for folding printed sheets of paper, as described. Also, the combination of the folding-knives with the reciprocating carriage, as set forth. Also, giving the reciprocating carriage its proper motion by means of the crank and slotted connecting rod, in combination with the lever and link. Also, the device for raising and depressing the fingers, as shown. Also, the combination of the folding and carrying nippers with the stationary folding-knife. Also, releasing the sheet from the nippers, by means as described. Also, the circular knives for separating the sheets, when operated in the manner described. Also, the combination of the levers with double concentric rock-shafts, in the manner set forth. Also, the adjustable check and the mode of releasing its hold by the advance of the nippers, as set forth.

11. Machine for Folding Paper; Steuben T. Bacon, Boston, Assignee through mesne-assignment of Edward N. Smith, formerly of West Brookfield, Massachusetts; patented Nov. 27, 1849; re-issued January 7, 1851; re-re-issued February 8, 1859.

Claim—1st, Forcing the paper required to be folded between the first set of folding rolls by the knife, while the sheet is on the run. 2d, Forcing the paper from the first fold between two converging and continuously moving, flexible, yielding surfaces. 3d, Forcing the sheet of paper required to be folded upwards, for the purpose specified. 4th, The use of a cord or curved edge knife, for the purpose of forcing the sheet between folding rolls. 5th, The stop for determining the proper position of the sheet for delivering its second and succeeding folds. 6th, The combination of the carrying bands with a stop for regulating the sheet in proper position to receive its second and succeeding folds. 7th, The combination of the rolls and endless aprons or bands with the guides. 8th, So arranging the knives, aprons, and rolls, in a paper-folding machine, as that the sheet may receive two or more parallel folds in succession. 9th, So arranging the carrying and folding rolls in a paper-feeding machine, as that only a single series of endless aprons or bands shall remain in contact with the sheet, to conduct it while it is receiving more than one fold. 10th, The lightening pulleys and cords or bands hung upon the movable bar, for the purpose of giving proper direction to the sheet receiving the next fold, after having received a parallel fold. 11th, So conducting a machine for folding paper, as that one or more folds may be omitted at pleasure, and the folded sheet delivered outside of the frame and the working parts of the machine, by simply detaching the knives and removing the stops. 12th, Supporting the folding rolls in adjustable boxes, bearings, or frames, for the purpose of squaring them with the print or register of the sheet to be folded, and providing for the construction and expansion of the endless aprons or bands. 13th, The movable guides for the purpose of squaring the knives to correspond with the print or register of the sheet. 14th, Conveying motion to any pair of folding rolls, running at right-angles to the preceding pair by means of level gears placed at or near the centre of a roll, and between the aprons or bands, whereby the machine is rendered more simple and perfect in its operation. 15th, Pressing the folding sheet previous to its delivery, by passing it between two conveying and continuously moving yielding surfaces.

12. Distillation of Oils from Coal; David Alter and Samuel A. Hill, Freeport, Assignors to selves, John T. Johnson, of said Freeport, Wm. F. Johnson, George S. Selder, and John L. Russell, Pittsburgh, Pennsylvania; patented April 27, 1858; re-issued February 8, 1859.

Claim—The destructive distillation of coal, or other bituminous substances, for the obtaining the liquid products thereof, in the form of what is known as coal oils, by the process described, viz: combining the use of a low temperature not exceeding a low red heat, say about 850° Fah., with the use of retorts so constructed as to have a rotary, or other equivalent motion, for the purpose of agitating their contents.

13. Arrangement of Means for Working and Stopping Chain Cables; Thomas Brown, London, England; patented July 25, 1854; ante-dated April 20, 1847; re-issued February 15, 1859.

Claim—The faring and radial-flanched annular recess in the capstan for working a cable of any given size, or cables of several different sizes, the same being constructed in the manner set forth. Also, in combination with a capstan or windlass which is capable of working a chain cable when only a partial turn is taken, a set of removable rollers so arranged in relation to the capstan, the deck-pipes, and hawse-holes, that either a port

or starboard chain cable can be continuously hove in by means of said capstan and rollers, or can be directly run out of its locker without any previous overhauling. Also, the within-described arrangement of bow-stopper and after-stoppers, whereby more cable can gradually and controllably be given to a vessel whilst riding heavily at anchor. Also, the clearing guide, in combination with the annular recess of a capstan or windlass which is capable of working a chain cable where only a partial turn is taken, for the purpose and in the manner set forth.

14. BANDAGES; N. Jenson, Washington City, D. C.; patented December 14, 1858; re-issued February 15, 1859.

Claim—The extension spring-frame, arranged so that when the sides are closed by the pressure of the limbs, the rear of the frame will remain open, for the purpose as set forth. Also, the combination with the exterior frame, or when constructed and arranged as described.

15. MACHINE FOR MAKING NUTS, WASHERS, &c.; James Wood, Philadelphia, Pennsylvania, Assignee (through mesne-assignments) of Wm. Kenyon, Steubenville, Ohio; patented October 14, 1851; re-issued February 15, 1859.

Claim—1st, Making nuts for bolts by subjecting the blanks of which the nut is to be formed, at a welding heat, to compression between swages or dies in a close die or matrix, and punching the eye of the nut during the continuance of such pressure, for the purpose of welding up any imperfections in the iron, and giving a symmetrical shape and smooth finish to the nut, and of preventing any injury to the nut which it might suffer by the passage of the punch through it, if it were not thus restrained by the sides of the die-box, and forcibly compressed between the dies. 2d, The use of a die-box closed at the sides for surrounding the nut, and sustaining its sides while it is subjected to pressure. 3d, The combination of the compressing die with the die-box, for the compressing of the nut while it is sustained at the sides, and thus welding up any imperfections in the iron, and compacting its fibre so as to give strength as well as exterior finish and symmetry to the nut. 4th, The combination of the punch with the die-box and compressing dies, for the purpose of compressing, confining, and restraining the opposite forces of the nut during the passage of the punch through it; and thus preventing any injury to the nut during the process of punching, and also for the purpose of ensuring the making of the bore of the nut in the proper relative position to its upper and lower surfaces. 5th, The combination of the die-box, the compressing dies, and punch, for the purpose of making hot-pressed nuts at a single operation, by severing a blank from a bar of heated metal, compressing it into shape, and punching a hole or eye through it, while under compression, and delivering the finished nut from the machine. 6th, Arranging the compressing dies in relation to the punch, and regulating their relative motion, in such manner that any excess of iron in the blank shall be forced into the path of the punch in the compressing dies, thus securing the compression of the nut without risk or damge to the machine.

16. RAILROAD CAR SPRINGS; The Railroad Car Spring Co., Philadelphia, Pennsylvania, Assignee (through mesne-assignment) of Henry M. Paine, Worcester, Massachusetts; patented Oct. 27, 1857; re-issued February 15, 1859.

Claim—A railroad car spring consisting of a body of felt, or other fibrous material, condensed to a given density between two rigid plates, and prevented from expanding beyond that density by a bolt or bolts, substantially as set forth.

17. EXTENSION FINGER RINGS; Samuel Friend and George Seiler, City of New York; patented Dec. 21, 1858; re-issued February 22, 1859.

Claim—A divided springing ring, constructed in the manner specified, whereby the springing of the ring permits the same to pass the joints.

DESIGNS.

1. STOVES; Apollos Richmond, Brooklyn, New York; dated February 1, 1859.
2. HOT-AIR FURNACE; Hiram Bissell, Hartford, Connecticut; dated February 15, 1859.
3. GAS BURNERS; Hiram B. Musgrave, Cincinnati, Ohio; dated February 15, 1859.
4. CARPETS; Elimir J. Ney, Lowell, Mass., Assignor to the Lowell Manufac. Co.; dated February 15, 1859.
5. CARPETS; Elimir J. Ney, Lowell, Mass., Assignor to the Lowell Manufac. Co.; dated February 15, 1859.
6. STEREOSCOPE CASES; Wm. Loyd, Philadelphia, Pennsylvania; dated February 22, 1859.

MARCH 1.

1. ROTARY ENGINES; Abraham Andrews, Bernville, Pennsylvania.

Claim—1st, The mortised valve and its connexion with the rod, as operated by the cam wheel, in combination with the said axle or shaft. 2d, The arrangement of the plungers with their side rollers and cam wheels, in combination with the axle or shaft, as described.

2. BRICK MOULDS; Joel W. Andrews, Norristown, Pennsylvania.

Claim—The arrangement of the pivoted handles, links, and bars, connected to movable bottoms, in the manner set forth.

3. INVALIDS TABLE; Jonathan M. Allen, Worcester, Massachusetts.

Claim—The combination of the revolving table, bed, or leaf, with the column, made adjustable, and capable of being fastened in position, as described.

4. SEED PLANTERS; John C. Baker, Mechanicsburgh, Ohio.

Claim—The arrangement of the wheels, cams, lever, friction roller, and disc, constructed as set forth.

5. MACHINE FOR CROSS-CUT SAWING; Joseph Battin, Newark, New Jersey.

Claim—The driving-pulley of the saw mandrel in connexion with the pulleys, one or both, placed in the carriage, and the driving belt, combined as set forth.

6. SEED PLANTERS; J. C. Benthall, Oakland, Texas.

Claim—The arrangement of the rock shaft, connecting rod, arm, spring, and pendant, for the purpose of enabling the seed-distributing device to be actuated by the leg of the operator.

7. AMALGAMATING RIFFLES; J. S. Briggs, Michigan Bluffs, California.

Claim—The cup punch, as constructed, for saturating wood with quicksilver.

8. HARNESS ATTACHMENT FOR SUPPORTING DRIVING LINES; T. D. Brown, Montville, Ohio.

Claim—An attachment or line-supporter, to be placed on a horse's rump, by securing it to the harness in

the manner shown, or in any equivalent way, said attachment consisting of the adjustable strap, pin and clasp, cross-piece, adjustable standard, and arms, arranged as described.

9. TRAM-STAFFS FOR FACING MILL-STONES; Thomas Brown, Kenwood, New York.

Claim—The arrangement and combination of the supporting ring, arranged to rest or lie on the face of the stone, with the triangular frame and adjustable staff, by which mill-stones may be faced more accurately and with greater facility, either plain or with suitable concavity or bosom.

10. HARVESTERS; Charles Brownlich, Buffalo, New York.

Claim—The pivoted shoe connected to the rear end of the frame of the machine, by means of the bolt upon which it oscillates, in combination with the levers, as set forth.

11. CORN HARVESTERS; J. L. Chapman, Kimmandy, Illinois.

Claim—1st, The combination with a corn harvester frame, having V-shaped conductors, of sickle-shaped revolving cutters, partially serrated and partially plain-edged stationary cutters, upper and lower horizontal spring guides, and endless apron, arranged as set forth. 2d, The partially serrated and partially plain-edged stationary cutters, of the form described, in combination with the rotary cutters, as set forth.

12. HARVESTERS; George E. Chenoweth, Baltimore, Maryland.

Claim—A polygonal step having more than four sides, in combination with a standard or post, the lower of which corresponds in figure with the interior of said step, as described.

13. BEE-HIVES; George H. Clarke, East Washington, New Hampshire.

Claim—The construction and arrangement of the bars, the same consisting in making each of them with a salient, angular, or sharp, or nearly sharp, lower edge or surface, extending lengthwise of it and downward from it, the several bars being arranged at convenient distances for the bees to pass between them or upward into the chambers, as described.

14. ROTARY SHINGLE MACHINE; Anson Alcott, Lakeport, New York.

Claim—The combination of guides, springs, connected therewith, slide, reciprocated from the movement of the cutter wheel, and the shingle cutter, arranged as described.

15. SPICE AND COFFEE MILLS; Charles R. Edwards, Suspension Bridge, New York.

Claim—The burr provided with the flanch and handle cast in one piece, in connexion with the concave grinder having the axle cast upon the same, arranged as set forth.

16. HEMMING GUIDES FOR SEWING MACHINES; Wm. Clemmons, Nicholasville, Kentucky.

Claim—The combination with the hemming attachment of the spring placed in the groove under the pressure pad, as described.

17. SAUSAGE-STUFFER; Henry L. DeZeng, Geneva, New York.

Claim—The construction and arrangement of the parts, A D F, substantially in the manner set forth.

18. WASHING MACHINE; L. A. Dole, Salem, Ohio.

Claim—1st, The arrangement of two winged rollers with a flexible adjustable apron clothes bed, in the particular manner specified. 2d, The use of a flexible apron clothes bed, when made adjustable, as set forth. 3d, The use of an adjustable swinging, self-opening, and self-closing rubber or leather packed valve or partition, in combination with the adjustable flexible apron bed, as set forth.

19. SEEDING MACHINE; Carloss and Darwin E. Eggelston, Beloit, Wisconsin.

Claim—1st, The arrangement of the rotating shaft in two or more parts, driving-pulleys, pulley encasement, seed pockets, stationary perforated bottom piece, adjustable slide, and cut-offs. 2d, In combination with the above, the shipper, and adjustable slide bar or gauge, when the shipper is pivoted to the gauge, to operate as specified.

20. MACHINE FOR BLOWING UNIFORM CURRENTS OF AIR; Jonathan Griffin, Harpersfield, New York.

Claim—1st, Operating the feeders alternately by means of the cross arms with the rollers traversing the curvilinear elevating ways. 2d, Regulating the quantity of air admitted into the air chamber, according to the quantity required, by means of the check wire and sliding arm or brake operating on the balance wheel, arranged as described. 3d, Connecting the top and bottom of the air chamber by means of india rubber straps, or other springs, when used in combination with the mechanism for driving the feeders to overcome and stop the operation of the motive power when the chamber is full, and thereby steady the current of air, and prevent too great strain on the chamber.

21. LAMPS; Elias J. Hale and Charles H. Chandler, Foxcroft, Maine.

Claim—Our improved rack wick-holder, as constructed and applied to the wick and the spur-wheel, so that the teeth of the latter may pass through the rack, and act on both the rack and the wick at one and the same time. Also, the flanch or collar, for the purpose of equalizing the aerial current as it strikes the flame of the wick.

22. APPLICATIONS FOR RESTORING THE HAIR; Beverly Harris, New Orleans, Louisiana.

I do not claim the use of castor oil, bay rum, alcohol, or quinine for hair tonics, as I am aware these ingredients have heretofore been used for this purpose.

Claim—The use of bitter apple and gunpowder, in combination with the before stated ingredients, when used in substantially the same proportion as set forth, and for the purpose of hair tonics.

23. REVOLVING FIRE ARMS; Wm. C. Haynes, Melrose, Texas.

Claim—Combining with a stationary barrel having several tubes or chambers for shot, a rotating cylinder, having groups of chambers, each group of chambers being so arranged as to correspond with the chambers or tubes in the barrel, and also so arranged in connexion with a single cone, or its equivalent, to each group, that the explosion of the cap, or its equivalent, shall fire the whole group to which the cone upon which it was exploded belongs, as set forth.

24. MANUFACTURE OF TIN-FOIL; Wm. W. Huse, Brooklyn, New York.

Claim—The production of tin-foil having but an outer casing of tin, or its alloy, covering a filling of lead or its alloy, by the reduction by pressure of a cylindrical bolt of the latter metal or alloy, which has been previously coated by dipping with the former metal or alloy, and the repetition of the dipping at suitable stages of the reducing process, as described.

25. APPARATUS FOR DISTILLING; Peter Kessler, Belleville, Illinois.

Claim—The employment of the stills and cooler, in combination with the vessels, when said vessels are arranged so as to have a tapering space and an intermediate circulating passage between them, as set forth.

26. Harvesters; David P. Kinyon, Raritan, New Jersey.

Claim—The arrangement of the frame which supports the driving wheel, so that the adjustment of the relative position of the driving wheel and cutter is effected by the leverage of the inner frame, in the manner described.

27. Apparatus for Heating Buildings; Lewis W. Leeds, City of New York.

Claim—Combining the uses of steam and water for heating buildings, by means of one or more water vessels combined with a separate steam boiler, and applied in such manner that the steam from the said boiler is employed only to heat the water in the said water vessel or vessels, and that the said water vessel or vessels constitute the heater or heaters of the air, as described.

28. Horse Rakes; F. C. Kneeland, Hartford, Wisconsin.

Claim—The arrangement and combination of the shaft pivoted within the frame, and provided with the treadle, arms, and bar, with the frame, when the latter is pivoted to the axle, as described.

29. Fastening Bands on Bales and Packages; Hazard Knowles, City of New York.

Claim—The method of fastening the ends of a metallic strap or hoop, by passing each end of the strap or hoop through a slot in a metal plate, one edge of which slot is formed with a bent lip on the outer face, bending the end of the strap or hoop over and outside of such lip, and hammering or clenching down both the end of the strap and the lip, that the strap or hoop may be clasped or held irrespective of the body which is to be strapped or hooped.

30. Boiler for Generating Steam; Joseph G. E. Larned, Brooklyn, New York.

Claim—1st, The substitution for the parallel or concentric sheets of boiler plate ordinarily used to form the fire-box of steam boilers, of a continuous row or rows of upright water tubes, set side by side, to connect the steam drum or water space above the fire with a water bottom below it, in such way as to form by themselves a water jacket; said tubes being inserted in the sheet above and below by means of necks, or smaller continuations, the diameter of which is so much less than that of the tubes as to leave a sufficient thickness of metal between adjacent perforations of the sheet, when the tubes are placed near enough together to answer the purpose of enclosure; expressly disclaiming, however, the use of such necks, or smaller continuations, in themselves considered, or for any other purpose, or in any other arrangement than that set forth. 2d, The combination of rows of water tubes, set side by side, to enclose the furnace, with tubes arranged annularly to give increased surface, without reference to the particular method of inserting the enclosing or arranging the annular tubes. 3d, The method of inserting the innermost of the tubes, when arranged in pairs, one within the other, so that they may be taken out and put back at pleasure, and without injury, by means of a screw or lock nut joint at one end, and a combined screw and expansion joint at the other.

31. Pumps; Edwin Lawrence and Robert Safley, 2d, Waterford, New York.

Claim—A circular reciprocating double-acting pump, that will both raise and propel water on both sides of the cylinder at one and the same time, and by the same motion of the arms or piston, as set forth.

32. Apple-cutting and Coring Machine; A. F. Ledbetter, Westminster, North Carolina.

Claim—The cutter attached to the reciprocating frame, in connexion with the annular opening in the bench, and with or without the spout, the parts being arranged as set forth.

33. Machine for Crozing and Chamfering Barrels; Hiram Littlejohn, Troy, New York.

Claim—Crozing and chamfering barrels, kegs, or casks, by turning the bulging cylinders of staves in upon or against suitable rests or supports, and around rotating cutters, which turn in opposite directions, and describe circles of less diameter than the inside of the ends of the cylinders of staves, the cutters and the rests being so arranged together, and one or both of them made movable, that the cylinders of staves can be conveniently applied to and removed from the rests and cutters, substantially as set forth.

34. Horse Rakes; William H. Long, Lancaster, Pennsylvania.

Claim—The arrangement of lever, shifting lever plate, and tooth beam, with axle and regulating screw, constructed as set forth.

35. Paper made from Reeds; Henry Lowe, Belleville, New Jersey.

I do not limit myself to the described process of making reed paper, or to any other process equivalent thereto. But I

Claim—The use of reed fibre in making paper, said fibre being prepared from the reeds called Arundinaria, Macrosperma of Michaux, and employed in the manufacture of paper, as set forth.

36. Pumps; John M. Lunquest, Griffin, Georgia.

Claim—The arrangement of cylinders, piston heads, ball valves, air chamber, and valves, said valves being kept in position by proximity to each other and the sides of the chamber, in the manner specified.

37. Crossings for Railroads; Samuel Macferren and Strickland Kneass, Philadelphia, Pennsylvania.

Claim—The employment of inclined surfaces at the point where two rails intersect each other, when the said surfaces are arranged in respect to the intersecting rails, as set forth.

38. Carriage Spring; Edward Maynard, Brooklyn, New York.

Claim—Attaching the returned ends of the spring directly to each other by means of the shackle, as specified.

39. Treatment of Caoutchouc; Morris Mattson, Boston, Massachusetts.

Claim—My improved india rubber composition or manufacture, as made in manner substantially as specified, without any of the oxide of lead, but of caoutchouc, sulphur, and one or more others, or an earth or earths containing one or more finely divided oxides of iron, and employed in a quantity much greater than necessary for simply affording color to the compound, the quantity being essentially in the proportions as stated, or such as will afford the economical and useful results as explained.

40. Roofing Cement; Oscar S. Oaks, South Rutland, New York.

Claim—The employment, in combination with the other substances specified, of the alkaline solution of shellac and the sulphate of baryta, the whole being compounded substantially as and in about the proportions set forth.

41. Motive Power; John G. Mitchell, Collington, Maryland.

Claim—The application of weights in connexion with the shaft and treadle, so that when disconnected from the treadle the weights are in equilibrio, and subject to be moved by any agency applied to either weight at the end of the lever or arms, so as to produce motion in the machinery at the termination of the machine proper, arranged in the manner described.

42. Construction of Steam Vessels; James Montgomery, City of New York.

Claim—1st, Constructing the hulls of vessels with one or more cavities in the bottom, commencing at or near the stern, increasing in capacity sternwards, as set forth. 2d, Constructing the bottoms of vessels with corrugations extending from stem to stern, which give strength to the hull, and a portion of which form the cavity or cavities referred to. 3d, The described combination, an inclined screw propeller with a hull. 4th, Two or more rudders, operating in combination with the described longitudinal cavities in a ship's bottom.

43. Potato Diggers; Robert Niven, Yates, New York.

Claim—The combination and arrangement of the shoe or share, endless screen, and pendant or supplementary riddle, with the frame and side plates, sinuous slots, and slotted levers, operating conjointly as set forth.

44. Machine for Printing the Address on Newspapers, &c.; A. H. Nordyke, Richmond, Indiana.

Claim—1st, The arrangement of an endless conveyor for feeding the envelopes under the forms to receive the impressions, and delivering the same after printing, in combination with a driving set wheel. 2d, The two inclined tracks, K and L, arranged one above the other, in such manner that the forms may be carried up the inclined track, K, and delivered upon the inclined track, L, and brought by their own gravity down said track, and under the pressure rollers, and from thence to the point of discharge. 3d, The arrangement and combination of endless band, catch, and jointed track, K, for taking the forms from the end of said track, and delivering them upon the lower track, L, arranged as described.

45. Governor for Steam Engines; G. T. Parry and H. W. Evans, Philadelphia, Pennsylvania.

Claim—One or more revolving weighted spring levers, in combination with the sleeve and the connexions described, or their equivalents, between the said sleeve and levers, when the latter are hung to pins placed at such a distance from the centre round which they revolve, that the weights at the end of the levers shall move in the arc of a circle, contained within, or partially within, the circle described by the said pins, as set forth.

46. Churn; Andrew Patterson, Birmingham, Pennsylvania.

Claim—The combination of the chamber, a, with the chamber, b, when said chamber, b, serves the double purpose of a lid or covering for the cream in chamber, a, and a frame for the dash-wheel, driving-wheel, and crank, as described.

47. Ships' Propeller; J. K. Peters, City of New York.

Claim—The arrangement and combination of stops, arm, and blade (more than one blade with the stops being combined with the arm, when desired), as described.

48. Lock; Daniel Powers, Philadelphia, Pennsylvania.

Claim—The independent movable, expanding, and contracting fence, or its equivalent, as set forth. Also, the union of the upper and lower halves thereof, as specified.

49. Centre-board; Noah Pratt, Nicholson, Pennsylvania.

Claim—Applying the centre-board and appliances for operating the same in a movable box or curb which is so fitted into a well-hole, or a stationary curb built into the vessel, as to be capable of being lifted out of said well-hole or curb with the centre-board and all its appliances, as described.

50. Harvesters; Daniel Ranck, Intercourse, Pennsylvania.

Claim—The combination of the inclined planes and springs, crank and connecting rod, spindle or pivot, sliding rake head, and curved supports, when these several parts are arranged in the manner described.

51. Ploughs; Isaac Rulofson, Penn Yan, New York.

Claim—The arrangement of beam, standard, landside strip, share, mould-board, and piece, constructed and united as set forth.

52. Screw Propeller; G. E. Safford, City of New York.

Claim—The hub made in two discs, with spiral or inclined slots to receive the floats, when the floats are removably secured to the hub, in the manner described.

53. Automatic Bell-ringer; E. N. Scherr, Philadelphia, Pennsylvania.

Claim—The manner of automatically producing music from bells by the employment of adjustable pins in the barrel, actuated by clock-work, or other motive power, and giving motion to the hammers, in any manner equivalent to that described.

54. Constructing Wharves; Alexander Stephens, Baltimore, Maryland.

Claim—Brace piles driven at a suitable angle, and having their heads so drawn back as to secure a purchase from the footing of the pile, when combined with vertical piles and capping logs, as described.

55. Smut Machine; D. P. Shaw and F. C. Brown, Rochester, Indiana.

Claim—The arrangement of the blast spouts with the scouring device enclosed within the cylinder, and the fan-box in connexion with the tubes, whereby the grain is subjected to a continual blast during the whole of its passage through the machine, to wit: prior to its advent into the cylinder while being acted upon by the scourer and after it leaves the scourer, as described.

56. Washing Machine; Wm. N. Slason, South Reading, Massachusetts..

Claim—The arrangement and combination of the squeeze gratings or boards with the reciprocating dasher or washer, or rinsing chamber. Also, the application of the separate soap-chamber to the wash or rinsing chamber, in manner set forth. Also, the arrangement of the windlass with reference to the box and brake, as specified.

57. Water-wheels; Jacob Stear, Smicksburg, Pennsylvania.

Claim—The combination of the cylinder, inclined ribs, and disc, with its buckets, constructed as described.

58. Hearth for Working and Refining Iron; R. D. Stewart and John Christopher, Digonier, and Ross Forward, Somerset, Pennsylvania.

We do not wish to be understood as claiming the steam chamber and perforated hearth described, of any particular shape or dimensions as applied in the various ways set forth, but claim its application in any shape or size required for the purpose mentioned. What we specifically

Claim—Is the steam chamber and perforated hearth, as described, for the uses set forth.

59. Apparatus for Slaughtering Hogs; G. W. B. Story, Carlisle, Pennsylvania.

Claim—The arrangement of the vertical shafts, lever, and bar, with the vertical rotating shaft, and the rectangular frame, constructed as set forth.

60. Mashing; N. G. Thorn, Dayton, Ohio.

Claim—1st, The perforations in the pipes attached to the hollow arms, or any analogous device, by which water, steam, or air is admitted into the mash-tub, in such manner as to distribute it equally, or nearly so, to all parts of the mash. 2d, The spiral agitators, when attached to any revolving machinery, for the purpose set forth. 3d, The surface agitators of whatever form, when attached to revolving tubes, for the purpose set forth. 4th, The use of a self-packing joint applied to mash-tubs, when used for the purpose set forth, in whatever form it may be constructed. 5th, The combination of the surface agitators with a stationary or revolving blast.

61. Corn Planters; Amos G. and A. J. Thompson, Belleville, Ohio.

Claim—The arrangement of spiral springs, in combination with cross-bar and straps, for regulating the movement of the plungers, as specified.

62. Machine for Scouring and Hulling Grain; Joseph N. Treadwell, Reading, Connecticut.

Claim—In combination with a bed-stone and runner for scouring and hulling grain, the grooves and rasping plates skirting said grooves, said parts being arranged and operating together, as set forth.

63. Sugar Cane Mills; A. Van Trump, Lancaster, Ohio.

Claim—The combination in a sugar cane mill of two or more intermediate small feed rollers, with four or more large crushing rollers, as set forth.

64. Skates; M. Vandenburg, Newark, New Jersey, and F. Berry, Oswego, New York.

Claim—1st, An elastic front to confine the foot to the skate. 2d, Rendering the foot-board adjustable to feet of various widths by constructing it in sections.

65. Piano-fortes; George Vogt, Philadelphia, Pennsylvania.

Claim—The employment of the described rest and bridge, either separately or combined, when the same are constructed and operating in manner set forth.

66. Water Metre; A. W. Von Schmidt, San Francisco, California.

Claim—Combining with the propeller, the radial partitions or feathers and the re-acting shutes, said feathers and shutes being arranged as set forth.

67. Harvesters; Russel Warner, Brattleboro', Vermont.

Claim—1st, The circular cutters attached to bars at the lower ends of rotating shafts, and having an independent rotating motion given them by means of the gearing. 2d, The combination of the cutters, plates, and shafts, with or without the sharpeners, arranged to operate as set forth.

68. Horse Rakes; Wm. H. White, Garretsville, New York.

Claim—The employment of the two levers when crossed diagonally and pivoted together at d, in combination with the turning rake head, frame, and seat, as set forth.

69. Ploughs; J. M. Whitney, Bolton, Massachusetts.

Claim—The arrangement of the hinged arms, adjustable brace, and standard, with the wheel and plough beam, constructed as described.

70. Cultivators; J. M. Whitney, Bolton, Massachusetts.

Claim—The arrangement of the teeth, adjustable mould-boards, frames, and cross-beam, with the branched swivel bar and frame, constructed as described.

71. Gauge Cock; John E. Wooten, Philadelphia, Pennsylvania.

Claim—The arrangement of the tube, in combination with the cam, rod, and valve, in the manner set forth.

72. Valve Gear; A. A. Wood, City of New York.

Claim—The combinations of the links attached to the eccentric rod, and arranged with adjusting gear, as described.

73. Manufacture of Steel; F. A. Lohage, Unna, Prussia, Assignor to E. L. Benzon, Boston, Massachusetts.

Claim—The art of manufacturing steel of any desired temper, or hardened according to the various purposes or uses for which the steel may be required, by arresting the decarbonization of the mass of metal in the furnaces at certain points or stages thereof, ascertained and recognised by means of certain phenomena, or external indications manifested by the material, substantially as described.

74. Making Bolts and Rivets; J. R. Bassett, Assignor to self and A. E. Bateman, Cincinnati, Ohio.

Claim—The die, substantially as described.

75. Cast Iron Fence Post; P. Stewart, Assignor to Auchambaugh Brothers, New Lebanon, New York.

Claim—A cast iron fence post, constructed with flanches to protect the ends of the fence rails against being split as well as against moisture, in the manner described.

76. Precipitated Sulphur; D. E. Paynter, Assignor to self and I. M. Bissell, Philadelphia, Pennsylvania.

Claim—Manufacturing precipitated sulphur from the ashes resulting from the combustion of gypsum and coal dust, in the manner described.

77. Tempering Steel Springs; James Jenkinson, Assignor to self and F. Mandel, Williamsburgh, N. Y.

Claim—Arranging the wires in such a manner that by tying one end of each of the same to one of the arms of the wheel on which the coil is formed, and by extending the ends so tied down to the hub of the wheel the loose ends of the wire serve to fasten the several rings of the coil, as described.

78. Measuring Faucet; W. W. Hollman, Eddyville, Kentucky.

Claim—1st, In combination with a faucet-piece, having an induction and eduction pipe, a receiving and variable chamber, so constructed and arranged, that by partially rotating it within the said faucet-piece, the liquid will be alternately received and discharged through a port or ports. 2d, Making the rod polygonal, when used in combination with the variable measuring chamber and its piston, as described.

MARCH 8.

79. WATER-WHEEL; Abraham Andrews, Bernville, Pennsylvania.

Claim—The curved concave buckets, in combination with the spiral chamber beneath, as described.

80. CAR-COUPLER; J. B. Atwater, Berlin, Wisconsin.

Claim—The arrangement of the falling gate provided with projection loosely hinged down, turned over at its top, and provided with inclined projection, adjustable piece, pin, lever, and catch, combined in the manner specified.

81. REGISTER FOR SHEETS OF PAPER; S. T. Bacon, Boston, Massachusetts.

Claim—Punching or cutting holes in sheets of paper, for the purpose of securing a more perfect and rapid register in printing and paper-folding machines.

82. DUMPING WAGON; Theodore Bailey, Friendship, Virginia.

Claim—1st, A wagon which dumps itself by the approximation of the wheels. 2d, The combination of a spring catch with the divided reach, as set forth.

83. CONNECTING HUBS AND AXLES OF VEHICLES; David Beard, Shippensburg, Pennsylvania.

Claim—1st, The peculiar manner of effecting a combination of the hub, short auxiliary axles, and intermediate stationary axle, whereby internal auxiliary bearings for the short axle, and an external main bearing for the hub are provided. 2d, Making the end of the main axle convex, and the main bearing in the inner end of the hub concave.

84. YOKES OF SHIPS RUDDER POSTS: W. Beers, Milan, Ohio.

Claim—The construction of a divided yoke for rudder posts, in combination with the employment of a guard of india rubber, or other elastic packing, between the yoke and the post, in order to prevent injury to the rudder post, and also to facilitate the repair of damages produced by the common yoke.

85. SHIPS STEERING APPARATUS; W. Beers, Milan, Ohio.

Claim—1st, The slotted arm or arms, constructed in the manner set forth. 2d, The elastic friction collar or collars, and the elastic guard or guards, in combination with the above described steering machine, for preventing concussion and friction. 3d, The friction rollers, in combination with the screw-nut, for preventing the nut from binding upon the screw.

86. TREATMENT OF VULCANIZED RUBBER; H. W. Beins, City of New York.

Claim—The process described of cementing vulcanized india rubber to, and covering it with, a new layer or unvulcanized india rubber composition, in the manner set forth.

87. ATTACHMENT TO RULING MACHINES; J. B. Blair, Philadelphia, Pennsylvania.

Claim—The application of one or more magnets (electro-magnets) to any ruling machine for ruling paper, in such manner that the magnets shall, either directly or indirectly, be made to control the operations of the pens, through the agency of the paper, in breaking, closing, or changing the circuit of electricity.

88. GRAIN SEPARATORS; J. L. Booth, City of New York.

Claim—A grain separator composed of a box, belt, plates, hopper, pulleys, and otherwise constructed as described.

89. FISH-TRAPS; Daniel Bowman, Tampico, Tennessee.

Claim—Making the dams to incline towards each other and up stream, so as to shelve over and make a dark recess to induce the fish to run towards the shute and trap, when the water is clear as well as when it is muddy. Also, the cover of the shute, for the purpose of shading the water and making it dark, so that the fish will be induced to enter the shute and trap.

90. TRUNKS; Henry Clifton, Buffalo, New York.

Claim—In combination with a trunk made up of a series of drawers, such as described, the hinged plates for holding and locking said drawers to the frame of the trunk, through the intervention of the lid and its lock.

91. HORSE RAKES; I. C. Burget, Davenport Centre, New York.

Claim—1st, The arrangement of the treadles hung to the frame, in combination with the rake-bar and yoke, for raising one end of the rake without disturbing the other. 2d, The combination of the springs with the arm and catch-plate, for holding the rake-bar in position, and at the same time to allow it to yield bodily to any obstruction there may be upon the ground.

92. SEWING MACHINES; J. H. Cooper, Philadelphia, Pennsylvania.

Claim—The combination of the shuttle-holder, arm, L, crank, and arm, M, or its equivalent, when the said holder is attached to, or forms a part of, the arm, L, when the latter is carried by the crank, and when the whole of the parts are arranged for joint action, as set forth.

93. ASHES SIFTERS; Allen Cummings, City of New York.

Claim—The combination of the pyramidal or conical-formed distributor interposed between the entrance and the sieve, the latter being of similar form inverted, these being arranged in relation to each other and to the diaphragm and receptacles.

94. CULTIVATORS; C. H. Dawson, Jacksonville, Illinois.

Claim—The plough-beams, arranged as shown, in connexion with the roller applied to the machine, as set forth.

[A series of ploughs are attached to an adjustable frame, which is connected to an axle, and so arranged that they may be placed higher or lower as desired, and the device is capable of being used as a gang or subsoil plough. In connexion with the ploughs, a roller is placed that crushes and rolls down weeds before them, thus facilitating their work.]

95. LAMPS; M. A. Deitz, Brooklyn, New York; ante-dated September 8, 1858.

Claim—The arrangement of an air chamber in the top of a lamp having a flat wick, when said lamp is provided with a cone or deflector for feeding air to the flame, and the air chamber, with a series of holes for the admission of fresh air, and openings for its passage upwards along the sides of the wick tube, or their or either of their equivalents.

96. MACHINES FOR FOLDING AND REGISTERING PAPER; A. F. Eudress, City of New York.

Claim—The arrangement of a series of folding knives at right-angles to one another in the same sliding

frame. Also, arranging the sliding frame in such a manner that it operates a registering apparatus by means of a lever, as specified.

97. ROTARY PUMPS; J. L. Fagan, Anaqua, Texas.

Claim—The combination of the rotating hollow shaft provided with a valve, the cylinder, A, attached to said shaft, perforated at a, and having the adjustable or hinged valve or piston, secured within A, and the stationary stop or cut-off attached to the bed-plate, and fitted within the cylinder.

98. BALLOONS; J. P. Gage, City of New York.

Claim—Operating upon the air by the instrumentality of the balloon itself, constructed in a diamond or lozenge-shaped figure, or any other substantially similar figure, presenting a flat surface to the air, arranged and adjusted with the car suspended from the lowest central point of the balloon by a rod with link joints, or their equivalents, and operated by the fore-and-aft and side halyards, in the manner described. Also, the manner of arranging and adjusting a diamond-shaped flat frame or surface (or any similar shape) to a spherical balloon, with the car suspended underneath, as shown.

99. COTTON SEED PLANTERS; C. C. Garrett, Spring Hill, Alabama.

Claim—In combination with the wheel and brushes, the adjustable plates, arranged as specified.

[In this invention a rotating toothed wheel is employed in connexion with stationary stripping brushes, the wheels and brushes being placed in the bottom of a seed-box which is provided with adjustable plates, the parts being arranged to operate, so that cotton seed may be planted in the same state that they are discharged from the gin, and the discharge of seed regulated as may be desired.]

100. OPERATING PUPPET VALVES OF STEAM ENGINES; Samuel Gaty and Omos Howe, St. Louis, Missouri.

Claim—1st, The steam lifters, J J′, exhaust lifters, K K′, and puppet heads, B B′, with their respective faces, for the purpose of operating steam and exhaust valves and puppet valve steam engines. 2d, The lifter, J, in combination with the jointed lifting piece, T, puppet head, B, and graduated cut-off ring or sector, for the purpose of producing a variable expansion motion, self-regulating or otherwise. 3d, The relative adjustment of the cut-off ring, for the purpose of admitting steam in equal quantities in each end of the steam cylinder, in the manner described.

101. STEAM GAUGE; W. Y. Gill, Henderson, Kentucky.

Claim—1st, Constructing a steam gauge, in which a piston acts in opposition to a spring, in such a manner that the lower portion of the same acts as an alarm by means of openings, and so that the indication may be marked on one or more sides of the upper portion of the stem. 2d, Constructing the portion of the piston of a smaller diameter than the lower and upper portion, and arranging the spring on the portion, above the lower packed portion and below the indicating portion.

102. BURNING FLUIDS; Jonathan Griffin, Stanford, New York.

Claim—The burning fluids, formed in the manner and of the materials set forth.

103. COTTON HARVESTERS; John Griffin, Louisville, Kentucky.

Claim—The cylinder, one or more, provided with a perforated plate, flexible tube or tubes, and made to communicate with the steam boiler by means of the tubes, as set forth.

["Picking cotton by steam!" is indeed a novel idea. The inventor connects a flexible tube with a cylinder provided with a perforated plate and connected with a steam boiler, so that a vacuum may be produced within the cylinder, and the cotton picked from the bolls on the standing stalks by atmospheric pressure, the tubes being presented to the cotton by suitable attendants. In carrying out this invention the inventor designs to have the cylinder above mentioned connected with the boiler of a traction engine, in order to facilitate the transporting of the machine and the moving of it from place to place, or from row to row, in the course of its operations. He also intends to use several cylinders and a plurality of tubes, so that many hands may be employed, and a number of rows of cotton be harvested simultaneously.]

104. METHOD OF OPERATING FARM GATES BY APPROACHING VEHICLES; A. J. Hamilton, Kewaunee, Illinois.

Claim—1st, In combination with the two road levers, the rigid actuating rods, crank levers, latch rod, swivel bar, and latches. 2d, In combination with the road levers, the elevations or hedges, as described.

105. CULTIVATORS; Theodore Heermans, Mitchelville, Tennessee.

Claim—1st, The screw-tapped shoulder or flanch and screw shank of the cultivator teeth, in combination with the screw nut having a series of auxiliary screws, in the manner described. 2d, In combination with the above, the specified arrangement of large and small cultivator teeth.

106. COTTON SCRAPERS; John Henderson, Bluff Springs, Mississippi.

Claim—The forked bar and brace bar, in combination with the beam and wings of a double-winged cotton scraper, when constructed in the manner set forth.

107. MACHINE FOR PRINTING RAILROAD AND OTHER TICKETS; R. M. Hoe, City of New York.

Claim—1st, The peculiar mechanism, or its equivalent, for moving the registering discs on their axes at the proper times, by which means the tickets are numbered consecutively. 2d, Giving such a movement to the registering discs, as will cause said discs to approach, press against, and travel with the impression cylinder, thus giving an impression to the roll of paper, then recede to change the figures of the discs, and allow the inking roller to perform and then again to approach the impression cylinder, and so on as before. 3d, The adjustment of any derangement of the registering discs caused by slip, jar of the machine, or other cause, by means of the plates, or any other means substantially the same. 4th, Inking in a different color the registering figures, by means of a separate inking apparatus. 5th, The printing the numbers on the tickets while the said tickets are continuously advancing, in the manner described. 6th, The guide placed between the impression cylinder and the cutter, or its equivalent, for restraining the strip of continually advancing paper in its proper direction, while its lower end is stopped by the action of the cutter when separating a ticket from the roll. 7th, The combination of the parts by which the tickets are deposited (after being cut) in a vertical position in contradistinction to flatwise in the trough destined to receive them. 8th, The combination of the slide, the spring catches, and the sliding block, by which accumulating tickets are kept in a vertical position.

108. ATTACHING CARRIAGE THILLS TO AXLES; F. L. Kidder, Williamsburg, New York.

Claim—The arrangement and combination of the pivoted spring plate, thill, spring, hook, and self-adjusting key, as described.

109. CORN HARVESTERS; J. H. Kite, Conrad's Store, Virginia.

Claim—The combination and arrangement of the horizontally revolving cutters, vertically revolving

bevel wheels, having plain peripheries, endless apron, axle, hollow shaft, and peculiar spring clutch arrangement, as set forth.

110. Machine for Turning Irregular Forms; D. H. Krauser, Pottsville, Pennsylvania.

Claim—1st. The manner of causing the carriage which supports the work to traverse over the cutters by means of the pulleys, belts, and endless chain, crank arms, and connecting rods, operating in combination with the means described for turning the work on its axis through the plates, bent levers, pawl, and ratchet wheel. 2d, The arrangement of the pulley, belt, and spindle, in frame, with the reverse pattern wheel, arranged as described.

111. Moulding Female Screws; Edward L. Lamb and Samuel Wood, Keokuk, Iowa.

Claim—The match-plate having both the exterior and interior of the pattern formed on it, when the same is divided vertically on a centre line, adapted to a suitable flask and resting guides, on which the two halves of the plate can be withdrawn laterally in opposite directions from the core, for the purpose of moulding female screws, or other articles which do not admit of having the pattern removed vertically from the core.

112. Metallic Lining for Water Coolers; Thomas Lavender, Philadelphia, Pennsylvania.

Claim—The lining or casing of an ordinary metallic vessel with tin, prepared and applied in the manner described.

113. Clothes Fastener; Lucius Leavenworth, Trumansburg, New York.

Claim—A clothes fastener made of a single piece or block, and having an open, angular, or curved groove therein to receive and hold the line and clothes upon it by diverging or kinking said line, and thus simplifying and cheapening the clasp by dispensing with the button heretofore used.

114. Chimneys; Joseph Leeds, Philadelphia, Pennsylvania.

Claim—In combination with an outer chimney or casing and an inner passage, two or more ducts or passages between the two for heat, ventilation, or draft, when said inner passages or flues are made by setting on top of each other iron sections with flanches upon them, as described.

115. Cotton Presses; Nathaniel J. Lilly, Selma, Alabama.

Claim—The combination of the boxes, bar, and followers, with the shaft, having the opposite ratchet thereon and the swinging weighted catch hung in the bar, together with the rack and pinion, operating as set forth.

116. Machine for Cutting Staves from the Block; James Little, Evansville, Indiana.

Claim—The hollow cylinder provided with the knives and gauge strips, in connexion with the bed and the feeding-belts, or their equivalents, arranged to operate as set forth.

117. Cultivators; Daniel and A. S. Markham, and David Eldred, Monmouth, Illinois.

Claim—The frame formed of two parts connected by the traverse bars, and provided with the sliding or adjustable frames, with the bars and ploughs, attached as set forth.

118. Seeding Machines; Daniel and A. S. Markham, and David Eldred, Monmouth, Illinois.

Claim—The adjustable standard, knife, share, wings, or mould-boards, with or without the tube, arranged for joint operation as set forth.

119. Refrigerator; H. L. McAvoy, Baltimore, Maryland.

Claim—The combination of rising and falling shelf-frame with a non-conducting refrigerating casing, as set forth.

120. Cooking Stoves; Josiah V. Meigs, Nashville, Tennessee.

Claim—The arrangement of the bottom plate of the oven in the same plane as the top plate of the fire-pot, in connexion with the arrangement of the flues leading from the side of the fire-pot directly beneath the bottom of the oven and around it, as described.

121. Churn; Jeremiah Mitchell, Gosport, New York.

Claim—The revolving box or churn, constructed in the manner set forth.

122. Machine for Shearing Sheep; Wm. F. Morgan, Rochester, New York.

Claim—The arrangement of the cutting device, scroll spring, and necessary gearing, as described. Further, the pressure lever, substantially as described.

123. Iron Pavement; James Montgomery, City of New York.

Claim—1st, A metallic pavement, consisting of a series of ribs or laminæ in planes, parallel, or nearly so, connected at alternate or varying levels by webs of metal, as set forth. 2d, Constructing metallic paving plates with ribs or arches of greater vertical depth in their intervening portion than at or near their sustained edges. 3d, The described combination of a concave or other suitable formed rail, with the projecting edge, and the paving plate, A, and the underlying edges of the plates, A and A′, for the purposes set forth. 4th, The described construction and application of the buttress-plate in connexion with the plate, A, and curb-stones, for the purpose explained. 5th, Connecting the edges of ribbed or arched paving plates by tongue and grooved joints, as shown, or in any mechanically equivalent form.

124. Iron Pavement; James Montgomery, City of New York.

Claim—A street-paving, presenting on its upper surface a series of ribs corrugated or winding in a horizontal plane, as set forth.

125. Harvesters; James Willard Patterson and Levi Hanford, Baltimore, Maryland.

Claim—The combination of the cutting knife, the bar, and projections, upon the guards, arranged in the manner described.

126. Cooking Stoves; Richard Peterson, Philadelphia, Pennsylvania.

Claim—The protecting plate with its perforations, when arranged in respect to the oven, the fire-place, and the flues of an elevated oven cooking stove, in the manner set forth, so that the products of combustion, after passing from the body of the fuel, and at the point where they impinge against, and are dispersed by, the said protecting plate, prior to passing some over and others under the oven, may be met by, and intermixed with, jets of heated air.

127. Bee-hives; William Powers, Youngstown, Ohio.

Claim—The cap or cover of double walls, the inner one perforated, and the space between filled with charcoal, in the manner specified.

128. Cleaning Castings; Andrew Ralston, Middletown, Pennsylvania.

Claim—The combination of flexible pickers, brooms, or brushes, having a reciprocating, alternate, or oscillating movement with an elevating and depressing table.

129. Harvesters; Andrew Ralston, Middletown, Pennsylvania.

Claim—1st, The arrangement of the receiving apron, sheaf-trough, compressing hook, and levers, when used in connexion with the horizontal and inclined gathering aprons, as described. 2d, The use of the shocking carriage furnished with a shock chamber, having a movable bottom in two parts, as described.

130. Pen-wiper and Paper Weight; John L. Rowe, City of New York.

Claim—The base or weight with cup attached provided with the sponge, in connexion with the pressure pad or sponge connected with the base by means of the frame, and arranged as described.

131. Eraser and Pencil-sharpener; Archibald G. Shaver, Hartford, Connecticut.

Claim—The curved blade eraser with the circular edge pencil-sharpener, and the groove for finishing the pencil point in combination, in the manner described.

132. Cradle-wagon; George Smith, Brooklyn, New York.

Claim—A cradle and wagon combined, when the several parts are constructed in the manner described.

133. Cocks for Water Basins; Horace W. Smith, Hartford, Connecticut.

Claim—The intermediate spindle, in combination with the vertical valve, in the manner set forth.

134. Propeller; Simon P. Snyder and George W. Cook, Minneapolis, Minnesota.

Claim—The arrangement and construction of a propeller, as described, also inclining the shaft of a propeller in relation to the boat in two directions, as set forth. Also, the combination of a screw-thread on the propeller shaft, with a screw-thread in the brace-plates forming the hub of the propeller, and with keys, for the purpose of adjusting and fastening the wheel on the shaft.

135. Ice Pitcher; James H Stimpson, Baltimore, Maryland.

Claim—A double or treble-walled ice pitcher, having its inside wall or shell composed of iron or other metal lined or coated internally with porcelain, as described.

136. Cotton Presses; Uriah T. Stuart and Calvin E. Stewart, Fayette County, Tennessee.

Claim—The combination of the rack and pinion with the rope and windlass for operating a press with two pressing-boxes, constructed as described.

137. Manufacture of Shot; Charles B. Tatham, Brooklyn, New York.

Claim—The combination of the netting pot, the regulating valve, the conductor, and the set pan, as described, for dropping shot.

138. Lamp-lighters; Leopold and Joseph Thomas, Brooklyn, New York.

Claim—The arrangement of a trigger, or its equivalent, in such a relation to a serrated sector and to a ratchet wheel, that by the motion of the trigger, a piece of fuse from a roller is fed up and lit, in the manner specified. Also, the arrangement of a continuous fuse, in combination with the lamp.

139. Brick Machines; John Van Riswick, Washington City, D. C.

Claim—The combination and arrangement of the carved or angular hopper with the mould-disk and vertically reciprocating plungers, whereby the upper plungers are caused to pass the hopper without lateral movement, in the manner specified.

140. Grain Cleaning Machines; Hugh Wallace and Wm. Mellon, North Sewickly, Pennsylvania.

Claim—The arrangement of the valve, ducts, and sieves, as described.

141. Seed Planters; George Watt, Richmond, Virginia.

Claim—The series of angular faced rollers arranged relative to their shaft, as described, for opening the furrows, in combination with the seed tubes and covers.

142. Water Wheels; Charles Wells, Monroeton, and Wm. Douglas, Bradford Co., Pennsylvania.

Claim—The combination of the scrolls, vertical buckets, and lower buckets, arranged as described.

143. Churn; L. J. Wicks, Racine, Wisconsin.

Claim—The arrangement in a square churn, which is provided wich a ventilating top, of the shaft, inclined arms, cross-pieces, and funnels, in the manner specified.

144. Apparatus for Evaporating Fluids; C. S. Wheeler, Flowerfield, Michigan.

Claim—Combining the evaporating pan with the steam boilers, in such manner as to cause the upper sides of said boilers to form highly efficient heating surfaces within said evaporating pan. Also, conducting the steam from the boilers to the engine, which may be combined therewith, through the medium of a series of pipes, which are so located that their peripheries form portions of the heating surface of the evaporating pan; but this I only claim when the said evaporating pan is combined with a series of steam boilers. Also, combining the spaces between the double bottoms of the clarifying pans with the steam boilers, when the said pans and boilers are arranged with each other and with the evaporating pan, as set forth. Also, the passing of the fluid to be reduced through a coil of pipe, located within the chimney or flue space, before discharging the same with the clarifying pans; but this I only claim when the said clarifying pans are arranged with the evaporating pan and the series of steam boilers, as set forth.

145. Burning Fluids; Wm. Wilber, City of New York.

Claim—A fluid compound for burning in lamps, &c., made of coal tar, camphene, and alcohol, substantially in the proportions and manner set forth.

146. Ploughs; Solomon Williams, Jr., Hume, New York.

Claim—The arrangement of the adjustable wheel with the landside of the plough, as described.

147. Firemen's Protector; C. D. Woodruff, Toledo, Ohio.

Claim—The double-walled sheet or plate metal house, and mounted on wheels, and provided with look-out holes, and an adjustable plate to receive the nozzle or butt, the house being placed on rollers in the platform, and secured by buttons, or their equivalents, arranged as set forth.

148. Seeding Machine; E. O. Baxter, Assignor to self, E. H. Riley, and W. T. Sweet, Forreston, Illinois.

Claim—1st, The cam, one or more, attached to wheel, in combination with the jointed pendant attached

to the lever. 2d, The levers, connected together and arranged relatively with each other and the driver's seat, as specified.

149. ELECTRO-MAGNETIC MACHINES; W. H. Burnap and J. A. Bradshaw, Assignors to W. H. Burnap, Lowell, Massachusetts.

Claim—Applying the oscillating balance wheel with its shaft in line with, but detached from, a rock shaft or its equivalent, carrying an arm which derives a positive oscillating movement from the train of gearing which drives the magnetic-electric machine, and connecting the spring, which is attached to said balance wheel, with the so arranged moving arm, as specified.

150. BURGLAR ALARM; R. M. Campbell, East Cambridge, Assignor to W. G Crombie, Boston, Massachusetts.

Claim—The application of the spring fastener to the alarm or its case, so as to be capable of sliding and turning with reference to the same, as specified.

151. ELECTRO-MAGNETIC FIRE ALARM APPARATUS; M. G. Farmer, Salem, and W. F. Channing, Assignors to W. F. Channing, Boston, Massachusetts.

Claim—1st, The independent keys with their pins, in combination with the rack and a means of liberating the rack, for the purpose set forth. 2d, The arrangement of the segments on the circuit wheel, in combination with the springs, or their equivalents, for throwing the electric current successively on to different circuits. 3d, The double circuit wheel, or its equivalent, for the purpose of completing and interrupting an electric circuit at both ends.

152. TABLE CASTER; R. Gleason, Jr., Assignor to R. Gleason & Sons, Dorchester, Massachusetts.

Claim—A caster, egg-stand, and table bell, arranged as described.

153. EXTENSION TABLE; Thomas Gray, Assignor to self and J. M. Sankey, Philadelphia, Pennsylvania.

Claim—1st, The method of constructing and of connecting together the two cross-bars, H and H′, that is to say, constructing one bar, H, in two parts, and connecting the two parts together by the two plates, which admit the bar, H′, and afford a means of joining it to the bar, H′. 2d, The combination of the screw, block, bars, and cross-bars, with the two ends of the table, arranged as set forth.

154. MACHINE FOR HEWING OUT HUBS; G. W. Miles, Michigan City, Indiana, and P. P. Lane, Assignors to Lane & Bodly, Cincinnati, Ohio.

Claim—1st, The arrangement and combination of the axles, stud shaft, and rotating rest, for hewing out cylindrical forms, in the manner set forth. 2d, In combination with the above, the ways, carriage, feed arm, pawls, and rack, as explained.

155. REGISTER FOR SHEETS OF PAPER; John North, Middletown, Connecticut, Assignor to self and D. Appleton & Co., City of New York.

Claim—1st, The attachment to the feed table of the printing press of two or more register points in addition to those commonly used for printing, so as to make register point holes in the sheet to be printed at the exact points required for the purpose of feeding the sheet in register to the folding machine to be folded. 2d, The application for that purpose of the described mechanism, or other suitable mechanism of the same general description, attached to the feed table, frame, and carriage of the printing press, and which will produce the intended effect.

156. BEDSTEAD; Samuel McQueen and Wm. Lyon, of the District of Abbeville, South Carolina, administrators of the estate of B. M. Lyon, deceased.

Claim—The use of the hinges in the middle of both the cross and longitudinal rails, in combination with the hinges between the rails and posts, as specified.

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157. ADJUSTABLE WORMER FOR RAMRODS; George E. Baldwin, West Meriden, Connecticut.

Claim—A wormer that can be run out of or into a ferule on the end of a ramrod, so that the ramrod can be practically shortened or lengthened at pleasure.

158. BREECH-LOADING FIRE ARMS; Joseph Barber and P. C. Reinfried, Bridesburg, Pennsylvania.

Claim—The arrangement and combination of the spring trigger guard, pin, toggles, sliding belt, and catch, as described.

[This invention consists of a sliding bolt connected with a toggle below the stock, and an elastic spring trigger guard, acting in combination with a beveled catch in the breech to lock the latter in line with the barrel for discharging, and also to unlock it for loading. A spring is also arranged below the breech to raise it to position for loading when it is unlocked.]

159. CHAIR BOTTOMS; Z. B. Bellows, Cortlandville, New York.

Claim—The application to chairs of a bent, stamped, or pressed board for a seat.

160. MAGAZINE FIRE ARMS; Paul Boynton, Canton, New York.

Claim—1st, Combining the powder magazine in the stock with the barrel of a fire arm, by means of the faucet-like chambered breech, applied and operating as described, to measure its own charge. 2d, Combining the bullet-loading slide with the faucet-like chambered breech, by means of the ears on the slide, and the horns attached to the breech, that the slide may be operated in combination with the breech, in the manner specified. 3d, The combination with the faucet-like breech of the priming box, and its perforated collar, q, operated by a connexion with the hammer.

[This invention consists in providing for the loading at the movable breech, with loose powder from a magazine within the stock, and with balls from a magazine under the barrel, whereby the operations of loading and firing are executed with great rapidity. By the act of cocking the hammer, a contrivance combined with the breech furnishes the priming for every charge.

161. MACHINE FOR BENDING WOOD FOR FELLOES; George A. Brown, Newfane, New York.

Claim—The arrangement of the platform, screws, and spring, with the mould-block, constructed in the manner specified.

162. MACHINE FOR GRINDING AND POLISHING SAWS; Samuel S. Campbell, Montreal, Canada.

Claim—1st. The specified arrangement of the longitudinal carriage ways on supports, so that they, with the carriage and all attachments, may be inclined laterally, and caused to stand obliquely to the horizon, or the circumference of the lap or grinding-stone. 2d, Arranging one of the supports of the machine on a pivot and the other on a truck, which reciprocates on a circular railway, so that the carriage ways and carriage,

with all attachments thereof, may be adjusted in the path of a circle, so as to stand oblique to the shaft of the lap or grindstone. 3d, Providing the longitudinal reciprocating carriage with a stationary stop and a capping or holding down plate, which is adjustable up and down, but stationary longitudinally.

163. APPARATUS FOR REGULATING THE SUPPLY OF WATER TO STEAM BOILERS; J. M. Colman, Vincennes, Ind.

I do not claim the float in boiler, or the cranks, levers, water-chest, valve, or detector. But I

Claim—The combined arrangement of these to effect the object desired, to regulate the water in a steam boiler to any desired point, from which it cannot materially change.

164. PACKING CARTRIDGES; Samuel Colt, Hartford, Connecticut.

Claim—The application of a string, wire, or other equivalent, to a cartridge package or box, by which the package or box may be opened.

165. GRINDING APPLES; A. Dean, Jerusalem, New York.

Claim—The crushing lever and horizontal wheel, constructed as described. 2d, The eccentric wheel and carriage, in combination with the cutter and wheel, I, constructed in the manner described.

166. PREVENTING COLLISIONS ON RAILROADS; Abram Dehuff, York, Pennsylvania.

I am aware that the shoe or boot running under the wheel is not new; it has been made by others, and I do not claim it. But I

Claim—The spring carrier hung on two inclined staples beneath the car or truck, to hug or embrace the wheels, cross-bar, C, long bar, E′, lever, F, rod G, lever, H, rod, I, levers, J J, and levers, K, arranged as described.

167. MACHINE FOR FOLDING WOOL; R. D. M. Edwards, Franklin, Michigan.

Claim—The table rim, the folding lids, operated by catches, levers, and springs, riser, and platform, constructed as set forth.

168. HANGING WELL BUCKETS; S. F. Dexter, Paris, New York.

Claim—1st, The iron strap with the levers and notch to receive the spring stretcher, in combination with the chain and the manner of detaching the same by coming in contact with the rod. 2d, The springs, when operated as described. 3d, Hanging the buckets at or below the bottom, in combination with the spring or springs and levers, as described.

169. CORN PLANTERS; Stephen Elliott, Washington, Indiana.

Claim—The arrangement of the wheel and pins, the spiral springs, the boxes, blocks, the rod, indicator, and leveling plough, constructed as described.

170. OBTAINING CURVED PRINTING SURFACES; Wm. H. Elliott, Plattsburg, New York.

Claim—1st, The combination of screws with the concave cylindrical form, when these devices are used for bringing the compound flexible matrix or impression sheet to the required shape, or for holding it there, while metal is being deposited or cast upon it, for the purpose of constructing electrotypes or stereotypes. 2d, The employment of bars in combination with the flexible sheet for holding the matrix in a cylindrical form, when said bars are so applied to the ends of said sheet, that they shall prevent its being displaced or springing up from the concave face of the outer shell, whether said bars are attached to or rest against the edge of said sheet. 3d, The grooves in the inner shell, for casting upon the back of cylindrical type plates, lugs, or flanches, by which said plates may be fastened upon a cylinder, as set forth.

171. SUGAR MILLS; Ralph Emerson, Jr., Rockford, Illinois.

Claim—The combination of parts in the machine, in such manner as to subject the cane first to a lighter pressure, and afterwards to a heavier pressure, and to deliver the respective juices expressed by said lighter and heavier pressures into separate receptacles, for the purpose specified. Also, the combination of the gauge fillets with the pressure rolls, whereby any unskilled operator is enabled to adjust and work the machine.

172. PROCESS FOR EXTRACTING AND ASSORTING VEGETABLE JUICES BY PRESSURE; Ralph Emerson, Jr., Rockford, Illinois.

As I have procured a separate patent for the said mill, I refer to that patent for a more full description of it. In this patent I do not mean to limit myself to any special means for the extraction and separation of the pith and rind juices. But I

Claim—The process of expressing and collecting the juice of the pith separately from that of the rind, for the purpose set forth. Also, as one of the methods (and the best to me known,) whereby the process of extracting the juices separately may be beneficially carried into effect, the subjection of the cane to a light pressure, to express the juice of the pith, previously to the employment of a heavier pressure, to express the juice of the rind, whether the said pressure be successively performed in the same or in different machines.

173. WATCH CHAINS, &c.; Henry Epstein, City of New York.

Claim—Constructing a watch chain, which may be made stiff or inflexible at pleasure, by the turning of part of the tubular casing to which an interior chain is attached, in the manner described.

174. OPERATING FEED ROLLERS FOR PLANING MACHINES; B. Fitts, Worcester, Massachusetts.

Claim—The arrangement of the gears in combination with the eccentric, constructed in the manner set forth.

175. SELF-PRIMING FIRE ARM; C. W. B. Gedney, City of New York.

Claim—The pivoted chamber or magazine within a recess in the hammer head, and operated by a link pivoted to the lock-plate, or some other stationary part of the pistol or other arm. Also, cutting off the priming of the edge of the hammer face, and carrying the same into the proper position for exploding upon the nipple or cone.

176. COMBINED LETTER AND ENVELOPE; E. B. Gleason, Boston, Massachusetts.

Claim—The combination therewith (that is, the letter sheet,) of the envelope composed of the superscription and post-mark portion, and the single flap, or the same and the two flaps, arranged together and with respect to the letter or billet portion, as described.

177. BARREL PACKER; W. H. Glasgow, City of New York.

Claim—1st, The rotary cam with barrel attached, in connexion with the vibrating hammer. 2d, The plate, having a rotary and a vertical reciprocating movement, for the purpose specified. 3d, The cam, plate, and hammer, arranged for joint operation as set forth.

178. APPARATUS FOR HEATING AND PURIFYING THE FEED WATER OF STEAM BOILERS; Jacob Guhmann, Rochester, New York.

Claim—The combination and arrangement of the bent siphon-shaped tube, having the induction and

eduction openings at the highest parts thereof, with low receiving portion, whereby the water is made to pass a considerable space of vertical pipe the more effectually to deposit its impurities in D', both while descending and ascending, together with the waste-cock and conjoint cocks, lever, and connecting rods and cranks, as described, for simultaneously opening and closing the same.

179. Machine for Dressing Heels of Boots and Shoes; Horatio Guild and Luther Hall, Boston, Mass.

Claim—The combination of the adjustable hub, jaws, and pattern thereof, with their curved supporting rack and the self-adjusting knife or knife-frame, applied together, and to a bed or table, or the equivalent thereof, as specified.

180. Meat Mincer; A. W. Hale, New Britain, Connecticut.

Claim—A cutting or mincing machine, operating by means of a cylinder or cylinders, having tapering grooves extending from end to end, in combination with, and revolving in, fluted or ribbed cases, and acting against a stationary knife or knives placed in a plane parallel with the axes of the cylinders.

181. Compositions for Roofing; John Hobrecker, Quincy, Illinois.

Claim—The process described of preparing plastic material of the composition stated, without the aid of external heat, for the purposes set forth.

182. Ships Lights; Enoch Hidden, City of New York.

Claim—1st, The swivel wrench of the button, and supporting the shaft or spindle thereof by the brace-piece above the frame. 2d, The inclined surfaced button with swivel wrench, in combination with the slotted lug of the main frame. 3d, In combination with the aforesaid construction, the attachment of the light frame to the main frame, by means of the hook and pin, as described.

183. Hoop-lock for Securing the Ends of Metallic Bands; P. C. Ingersoll, Green Point, New York.

Claim—The loop and key fitted together and applied to the hoop, as set forth.

184. Rotary Planing Machine; H. C. Ingraham, Guilford, and H. S. Ingraham, Granger, Ohio.

Claim—The arrangement of the cylinder with the two upper feed rollers and the matching burrs, in combination with the vertical sliding frame, for the purpose of preserving the same thickness of timber between the face of the board and the tongue and groove. Further, the sliding gripe, in combination with the ways, lever, and ratchet, arranged in the manner set forth.

185. Mode of Oiling Journals; D. B. Jordan, Woonsocket, Rhode Island.

Claim—The combination and arrangement of the shafts, the disk, the sliding valve, and the spout, constructed as described.

186. Spark Extinguisher; James Keniston, Cincinnati, Ohio.

Claim—A tank, arranged beneath the boilers of furnaces in such manner as to receive the sparks and cinders therefrom, and extinguish and discharge them by means of a current of water passing through the tank, as described.

187. Lanterns; W. M. Kimball and K. Hartman, Cleveland, Ohio.

Claim—The segments, the spring, and arm, or their mechanical equivalents, in combination with the hooks, arranged in the manner specified.

188. Locks and Latches; W. S. Kirkham, Branford, Connecticut.

Claim—The combination of the nosing provided with the double inclined flanch, with the bolt or latch, having its outer end rounded and leveled in a vertical plane, to operate in the manner set forth.

189. Peach-cutting and Stoning Apparatus; J. C. Kuhn, Boonville, Arkansas.

Claim—The knives curved and crossing each other and attached to the elastic bars, in combination with the lever provided with the pin. Further, the above parts, when placed on the box provided with a tube, and the several parts arranged relatively with each other, so that the stones will be separated from the pulp or flesh.

190. Railroad Gates; Shields Liggett, Staunton, Virginia.

Claim—The opposite sliding sectional gate, in combination with the levers, F F', rods, levers, G G', sliding bars, and springs, arranged as set forth.

191. Stereoscopes; William Loyd, Philadelphia, Pennsylvania.

Claim—A stereoscopic instrument having eye glasses at opposite sides and double reflectors, in combination with a revolving picture-holder, arranged as described. Also, the grooves on opposite sides of the frames, for the purpose of holding two pictures in contact with each frame.

192. Loading Ordnance; W. E. Moore, Crawfordsville, Indiana.

Claim—1st, The combination with a cannon, or other piece of ordnance, of a system of mechanism which will receive the charge, carry it opposite the bore of the cannon, force the same up to the breech of the cannon, and then be capable of being moved out of line with the bore of the same. 2d, In combining with the above system of mechanism, a needle for pricking the cartridge after it has been forced up to the breech, said needle coming into action simultaneously with the retreat out of line with the bore of the cannon, of mechanism employed for introducing the charge, and then retreated out of the way, ready for the application and explosion of the cap. 3d, The combination of a cap charger and exploding hammer with the first and second systems of mechanism above claimed, whereby simultaneously with the retreat of the needle a cap is brought over the touch-hole and exploded. 4th, A cartridge box, which has a yielding spring stop, in combination with the first system of mechanism above mentioned.

193. Car Brakes; W. E. Moore, Crawfordsville, Indiana.

Claim—1st, Making the windlass chain shaft in two parts, and uniting said parts by a universal joint, and arranging the main friction roller on one section, of the shaft, and the windlass drum on the other. 2d, The employment of an auxiliary friction roller, in combination with main roller and locomotive driving wheels, when said auxiliary roller is arranged to rise the main friction roller and the locomotive wheel, through the peculiar scale beam or weighing arrangement. 3d, The employment of a pivoted pawl, in combination with a racket drum having two circles of reversed set teeth, which incline on their deepest faces toward the centre of the drum.

194. Bottle Stopper Fastenings; H. W. Putnam, Cleveland, Ohio.

Claim—The bottle stopper fastening formed of two pieces of wire, the same being united by means of the points passing through the loops, constructed and having the wire adapted to them as herein described; thus forming a hinge and securing the same to the neck of the bottle by looping together the ends of the wire,

195. Mode of Applying Springs as a Motive Power; G. W. Morgan, Plattsburgh, New York.

Claim—The arrangement of the springs and wheels with lugs and pinions, concentrating the power on the pinions on each side of the wheel, and the pinions and shafts for winding up, at the same time, all the springs on either side of the wheel.

196. Speaking Tubes for Ships; D. S. Neal, Lynn, Massachusetts.

Claim—The arrangement of the speaking tube with a cask, or equivalent float, as specified.

197. Meat Cutter; J. G. Perry, Kingston, Rhode Island.

Claim—1st, Placing the knives on or across the shaft and holding them by their ends, to prevent them from turning. 2d, The manner of constructing the shaft and stud plates, as set forth.

198. Fastening for Folding Doors; E. S. Roberts, Brooklyn, New York.

Claim—The combination of the sliding bolts applied to folding doors, to operate as set forth.

199. Steering Apparatus; G. W. Robinson, Boston, Massachusetts.

Claim—The segment having the teeth on the interior vertical face of the curve, in combination with the gears and shaft connected with the tiller, and moving therewith, arranged in the manner set forth.

200. Preparing Hop Liquor for Brewers; A. S. Rollins, Albany, New York.

Claim—The preparation of hop liquor, for the purposes of distilling and brewing by the process set forth.

201. Water-wheel; P. H. Roots, Connersville, Indiana.

Claim—The wheel and rotating breast or abutment moving with different degrees of velocity, in combination with the apron or concave, arranged as set forth.

202. Washing Machine; J. L. Rowley, Angola, Indiana.

Claim—Constructing the bottom of the box with three sides of an octagon, the two outer sides to have ribs of an octagonal shape, set at an angle of 45° with the sides of the box and bottom, to be horizontal, with two rows of rubbing pins or knuckles set alternately with the valleys between the ribs, in combination with the vibrating rubber, having the rubber surface octagonal, and the rubbing knuckles set so as to work alternately with the spaces between the pins in the bottom of the box, and diagonally with the ribs on outer sides of the bottom.

203. Cast Iron Rails for Railways; J. E. Russell, Brooklyn, New York.

Claim—A cast iron railroad rail, having its neck vertically corrugated, as described.

204. Apparatus for Evaporating Sugar Juices; James Smart, Mansfield, Ohio.

Claim—1st, In the construction of pans, the combination of the inclined bottom with the inclined zigzag partition. 2d, The combination of two pans and two flame chambers, of the peculiar construction described. 3d, Supporting the pans at or near the centre of their length by pivots, and at their ends by spiral springs, as set forth.

205. Machine for Freezing Cream, &c.; S. W. Smith, Brooklyn, New York.

Claim—1st, The cylinders, in combination with the scrapers and reservoir, constructed in the manner described. 2d, Combining with the cylinders a perforated distributing reservoir, for the purpose of furnishing the material in the desired quantities to the cylinders.

206. Electro-magnetic Medical Apparatus; Heinrick Soltmann, City of New York.

Claim—The arrangement of the vibrating spring armature and the connexions therefrom, in combination with the key, arranged and acting as specified, to throw the shock off the person, or repeat the same. Also, the regulating cylinder, constructed in combination with the medical electrical machine, fitted and acting in the manner set forth.

207. Lever Jacks; Frederick Stamm, Lampeter, Pennsylvania.

Claim—The combination and arrangement of the lever and link rod, hinged together with the block and link seats, as described.

208. Rotary Stave Machine; George Starkweather, Hartford, Connecticut.

Claim—The horizontal revolving cutting rims for dressing staves on the two opposite sides at the same time. Also, the arrangement of one or more feed boxes upon the plate over the cutters, with the feeder produced from the worm.

209. Sugar Mills; T. E. Hunt, Assignor to self and N. T. Hunt, Indianapolis, Indiana.

Claim—1st, The combination and arrangement of the frame, rollers, and gearing, E, with the cone, gearing, F, bolt, and spring, constructed as set forth. 2d, The trough with aperture, constructed as set forth.

210. Device for Raising Water; D. E. Teal, Norwich, New York.

Claim—The arrangement of the rope or chains, the hooks, and bail of the cast iron box, adjustable flanch, collars on the windlass, and the windlass, whereby the bucket can be lowered, filled with water, raised and lowered, by merely turning the windlass.

211. Washing Machine; G. W. Tolhurst, Liverpool, Ohio.

Claim—The shaft, blocks, and wedges, or their equivalents, in combination with the oscillating rubber, slatted bottom, dirt chamber, and box, arranged as set forth.

212. Sail Wagon; William Thomas, Benton Co., Arkansas.

Claim—1st, The combination of the spars and cargo box on the rocking shaft, thus lowering the centre of gravity and increasing the stability of the fabric, not only in this way, but by also, and as another effect thereof, allowing the sails to yield to violent gusts of thwart wind, receiving their force gradually, and spilling it more and more as they decline. 2d, The hollow wheel hub, which I have called the barrel hub, to be used for the purposes of freight, thereby relieving the axle, avoiding friction, and adding to the power of the vehicle to stand up safely against strong cross winds.

213. Locomotive Fire-boxes; W. R. Thomas, Catasauqua, Pennsylvania.

Claim—The removable lining fitting with the shell and under the permanent water spaces of the fire-box, having inwardly projecting inclined sides, and combined with the water spaces of the boiler, by means of two rows of vertical tubes entering the crown sheet, and a pipe connecting with the body of the boiler.

214. Railroad Car Journal-boxes; Philip Umholtz, Tremont, Pennsylvania.

Claim—The spring yoke bolt, in combination with the follower and packing operating in the mortise of box, in the manner described.

215. Horse Power; J. S. Upton, Battle Creek, Michigan.

Claim—The arrangement of driving wheel with the pinions and wheels, in combination with the annular wheel, with toothed gear on its internal edge and on one of its faces.

216. Clasp for the Ends of Bands of Iron; Chapman Warner, City of New York.

Claim—The construction of a clasp of any material or dimensions of the form described, with two wedge-shaped projecting tongues placed in the position, fitted with sleeves, and protected by sides.

217. Railroad Car Coupling; N. H. Wentworth and M. S. Ames, Somersworth, New Hampshire.

Claim—Combining with each latch or catch a lever, as described, and providing the latch and lever, when thus combined, with the cams and their shafts and crank-arms, for actuating them.

218. Bread-making Table; W. K. Wyckoff, Ripon, Wisconsin.

Claim—The combination and arrangement of the flour chest, the table or mould-board, the mixing tray, and the closet, as described.

219. Steering Wheel; C. T. E Blaich and P. A. Bishop, Assignors to P. A. Bishop, Elyria, Ohio.

Claim—The vertically sliding dog being secured in suitable brackets and provided with a foot-piece, pawl, and joint, as described, in combination with the spiral spring and ratchet.

220. Sewing Machines; E. S. Boyton, City of New York, Assignor to P. R. Roach, Elizabeth City, N. J.

Claim—The use use of the adjustable fulcra for controlling the feed of the needle, in combination with an annular or ring-shaped shanked wire needle, as attached directly to the crank shaft, without the intervention of a needle box.

221. Hanging Reciprocating Saws; Addison Crosby. Assignor to H. S. Stephens, Fredonia, New York.

Claim—The two jaws or plates applied to the saw, connected together and suspended within the swinging or pivoted adjustable frame, which is attached to the plates.

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222. Scythe Snaths; S. B. Batchelder, Lowville, New York.

Claim—The arrangement of the hooks, screw, ring, and plate, with slot and sliding block, constructed in the manner described.

223. Wheels for Traction Engines; Wm. Bray, Folkstone, England; patented in England, Dec. 31, 1856.

Claim—Constructing traction engines with driving wheels with blades or teeth which are capable of being protruded and withdrawn.

224. Submarine Telegraph Cable; F. J. Bridges, City of New York.

Claim—The braided or plaited coat, covering, or layer for conductors, cords, or cables, for electric telegraphic purposes, as set forth.

225. Metallic Bands for Baling; George Brodie, Little Rock, Arkansas.

Claim—Preparing the hoops or bands for tying before they are passed around the bale, by bending one or both ends of the hoops or bands, and placing in the inside of each band a suitable prepared metallic pin similar to those I have already described, around which pins the bent end of the hoops are securely pressed, for the purpose of keeping the pins in place. and also making the ends of the hoops wider or thicker as the shape of the connecting links used may require. Also, forming the connecting links like those shown. Also, bending one or both ends of the hoop or band around the outer ends of the connecting link, thereby strengthening the ends of the link, and preventing it turning or getting out of place, and the tie from untying. Also, making metallic hoops for bending bales, with a tie on each side of the bale. Also, using strips of cloth, paper, or other suitable material, under the metallic hoops, for the purpose described.

226. Fastening for Shirt Studs, &c.; Barnes Clayton, Philadelphia, Pennsylvania.

Claim—The stem rigidly fixed to the piece of the back part, the vertically moving lever plate, and the screw stem fixed to the front or ornamental part, and for the purpose of fastening the stud in place, so that it cannot be pulled out or removed therefrom, without first rotating the screw, as described.

227. Adjustable Dental Swages; E. H. Danforth, Jamestown, New York.

Claim—Forming the labial and the lingual curve of dental plates for the inferior maxillary alveolar ridge, by swaging it into form with the compound die and malleable plates in the curve of the plate.

228. Instrument for Ascertaining the Distance between itself and the Target, without Chaining; B. D. Villeroi, Philadelphia, Pennsylvania.

Claim—The addition, by means of a screw, of a tube containing the lens, and divided throughout its whole length by a vertical partition or diaphragm. At the extremity of this tube, next the eye-piece, is placed a ring containing a bisect lens, the two halves of which are equally inclined on opposite sides of the vertical plane, perpendicular to the axis of the telescope.

229. Corn Huskers; H. A. Doster, Bethlehem, Pennsylvania.

Claim—The arrangement and combination of the lever with the adjustable roller, so that when the roller is adjusted, the distance between the cam and the fulcrum of the lever will be correspondingly changed.

230. Weather Strips; John L. Faber, Sr., South Headly, Massachusetts.

Claim—1st, The bar, in combination with the parallel vibrating links, when said bar is so arranged as to fall by its own weight, and be forced against the door by the closing of the latter. 2d, The combined arrangement of the several strips and their attachments, to close up the frame sides of the door.

231. Filters; John Fitch, Seneca Falls, New York.

Claim—The combination of the cylinder, constructed and partly filled with the outside case, having the perforated plates and the filtering material disposed and arranged as described, by means of which the fluid to be filtered is made to pass through the filtering material for a greater distance, and a more perfect purification effected. I also obtain, by the same combination, a convenient mode of cooling the fluid, and also of cleansing the filter, without deranging its parts, by means of reversing its action.

232. Coffee Mills; R. B. Fitts, Philadelphia, Pennsylvania.

Claim—The cylinders, B and B, in combination with the grooved cylinder, C, and and its adjustable concave, arranged together beneath the hopper, so as to operate in the manner described.

233. Fly-wheels for Rolling Mill Machinery; Jacob Geyser, Allegheny, Pennsylvania.

Claim—Constructing the rim of a fly-wheel hollow, with partitions, in such a manner that when the heavy materials are piled in, laid in concrete, it may be held stiff and steady. Also, using any heavy and hard material along with suitable cement, to fill up such a rim.

234. Letter Envelopes; Emanual Harmon, Washington City, D. C.

Claim—The method or process of preparing letter envelopes ready ruled in the process of manufacture, in the manner set forth.

235. Dough Rolling Machine; John Hecker and Wm. Hotine, City of New York.

Claim—The combination of an inclined endless apron for receiving and returning the dough, in combination with the cylinders for rolling the dough. Also, in the above combination, the curving in of the apron around the upper roller, or the equivalent thereof, for the purpose of returning the dough to the feed table, in combination with the cylinders for rolling the dough. Also, the rotating screen, in combination with the arrangement of cylinders for rolling and working the dough. Finally, in combination with the rotating screen, the hopper and apparatus therein, for insuring a regular supply of flour.

236. Filters; A. Jaminet, St. Louis, Missouri.

Claim—1st, Circulating the water to be filtered through tiers or courses of pipes, arranged within a drum, having a current of waste steam passing through it, and then passing said water into separators for further circulation, and of depriving it of mud and other foreign matters. 2d, Arranging the separators within the steam drum. 3d, Making the apparatus self-cleansing, at intervals, by operating the valves at the bottom of the separators and filters, by levers acted on by toothed discs, ratchet wheel, and pawl, or their equivalents, actuated by the automatic movement of the clear water trough in tippling or tilting, to discharge essentially as set forth. 4th, Controlling the automatic discharging action of the clear water trough, by means of a flutterer or float, arranged therein, and serving, by connexion with an unlocking lever, a stop-piece, and catch or hook, to hold the trough from prematurely tilting.

237. Making Ornamental Chains; James Launcelott, Cranston, Rhode Island.

Claim—The method described of weaving a chain from sheet metal, by forming the base of each link into a geometrical figure, and by bending each arm longitudinally, at the same angle as one of the outer angles of the base, so that a cross-bar on the extremity of the next proceeding link shall, when bent down, bear against the angular side of two of the arms of the next succeeding link, and thereby enable the chain to withstand a strain nearly equal to the cohesive strength of the metal of which the links are formed.

238. Mode of Marking and Ornamenting Paper; Thomas Mackenzie and Albert Trochsler, Boston, Mass.

Claim—Paper for writing, printing, and other purposes, having indelible marks or designs stamped thereon, by condensing the fibres thereof by pressure.

239. Motive Power; Charles Mans, Danville, Pennsylvania.

Claim—The arrangement of the drums, wheels, pinions, fly-wheel, and sectional weights, combined as described.

240. Breech-loading Cannon; James H. Merrill, Baltimore, Maryland.

Claim—1st, The combination of the breech-piece and frame, so that the former may move back and forth, and have its bore raised up and lowered on the latter automatically, and fastened or locked. 2d, In combination with the screw for running the breech-piece forward and backward, the mechanism for lowering and raising the rear of said breech-piece.

241. Post-office Hammer Stamp; Ezra Miller, Janesville, Wisconsin.

Claim—A post-office marking stamp, which has its handle running parallel, or nearly so, with its marking face or faces.

242. Device for Equalizing the Tension of Watch Springs; J. J. Parker, Marietta, Ohio.

Claim—Making and constructing a barreled cog-wheel or drum for time-pieces, or for other purposes, so as to equalize and regulate the power of a spring, in manner set forth.

243. Envelope; S. E. Pettee, Assignor to the North American Paper Bag and Envelope Manufacturing Company, Philadelphia, Pennsylvania.

Claim—The form of envelope blank described and represented, whether cut from a continuous roll of paper, or from separate sheets.

244. Faucet; James Powell, Cincinnati, Ohio.

Claim—The arrangement of the cam, flanches, longitudinal slot, and spurs, combined in the manner set forth.

245. Rotary Engine; T. T. Prosser, Fond du Lac, Wisconsin.

Claim—A wheel with a spiral passage diminishing in size from the centre to the periphery, as described.

246. Heels for Boots and Shoes; Joseph Read, Philadelphia, Pennsylvania.

Claim—A composition heel for boots and shoes, consisting of the composition moulded into the form of a heel, with the concavity in the upper side of the same, as described, and the leather lift or bottom piece, in combination with the leather edge piece, applied and secured thereto, as set forth, the said heel being adapted for subsequent application to a boot or shoe.

247. Amalgamator; H. P. Russ, San Francisco, California.

Claim—Portable or movable cups or cones of copper, galvanized or amalgamated with quicksilver inside, or manufactured of other materials, such as wood, cast iron, &c., to be placed in holes in sluice boxes, or other apparatus used in mining for the precious metals.

248. Pump; L. B. Schafer, Baltimore, Maryland.

Claim—The arrangement for operation together of the pump, shear, link, hand brake, and piston rod, as set forth.

249. Brick Machine; J. T. Schuffenecker, Keokuk, Iowa.

Claim—1st, The safety openings, in combination with the quadrant, arranged and operating in the manner specified. 2d, The shutter operated by the fork, spring, and bar. 3d, The manner of leveling the mortar in the moulds by means of the two scrapers.

250. Instrument for Enlarging Photograph; David Shive, Philadelphia, Pennsylvania.

Claim—The arrangement of the illuminating lens in the usual open end of a photographic camera, supported in connexion with the adjustable paper-holder upon a stand, so as to operate in the manner specified.

251. Casting and Annealing Articles made of Scoria; Wm. H. Smith, Philadelphia, Pennsylvania.

Claim—1st, The construction and use of the horizontally revolving casting wheel, for facilitating the casting of slag and similar mineral products. 2d, The construction of an annealing chamber having various modes of retaining and regulating the heat therein, viz: by a series of dampers, by the construction of grooves and troughs in the walls, in connexion with the flanches and dippers of the bed, with or without the use of sand, by the devices at the ends of the wagons, and by the use of the ante-chambers. 3d, The use and combination of a series of rollers with a traversing bed, for imprinting an entire pattern of different colored figures. 4th, The construction and employment of segmental sliding moulds, as shown, or of similar character, and the mode of arranging and working the same, as described.

252. Gas Burning Stove; James Spear, Philadelphia, Pennsylvania.

Claim—The combination of the sled in the door frame with the ring, and the cylinder, and the body of the stove, constructed in the manner set forth.

253. Apparatus for Skimming the Surface of the Water in Steam Boilers; A. M. Sprague, Mobile, Ala.

Claim—The surface skimmer, constructed as described, for the purpose of removing the sedimentary water from the upper water surface of steam boilers.

254. Car Coupler; C. E. Stevens, City of New York.

Claim—The combination of the yielding support within the mouth of the aperture of railway car boxes, with one or more blocks inside and the annular flanch outside the said boxes, arranged as described, to effect the coupling of the boxes automatically, by the action of straight links and locking bolts.

255. Mode of Fastening Sheets of Paper together; E. S. Swartwout, Utica, New York.

Claim—The metallic clasp, in combination with the perforated metal plate, for fastening together legal and other documents, constructed as described.

256. Cheese Press; Charles Taylor, Little Falls, New York.

Claim—1st, Attaching the one end of the press bars to the bottom of the box, and the other end of the crank pin on the wheel, whereby I am enabled to shorten the movements of the follower, and have an eccentrically operating press, compactly arranged. 2d, The spring bed-piece and the spring acting upon the wheel, on the extreme upward movement of the follower, and thus upholding the follower.

257. Filter; Louis Tilliers, West Morrisiana, New York.

Claim—A hygienic purifier, constructed in the manner and operated as described.

258. Paddle-wheel; Nathan Thompson, Bridgeport, Connecticut.

Claim—The arrangement and combination, in the manner described, of the triangular floats with the arms to prevent the formation of the vacuum, the lifting of back water, &c.

259. Method of Securing Bits in the Stock; Wm. Tucker, Blackstone, Massachusetts.

Claim—The application or arrangement of the screws and the segmental button with respect to the bit or boring tool socket, and to operate with or on the tool, as specified.

260. Carpet Fastener; C. F. Spencer, Rochester, New York.

Claim—A carpet fastener made of a single piece of plate metal of a triangular or three-pointed form, one point serving as the shank to be driven into the floor, another point as the hook for receiving the carpet, and the third point as a head so shaped as to enable the fastener to be driven with facility into the floor.

261. Shingle Machine; W. P. Valentine, Fond du Lac, Wisconsin.

Claim—1st, Varying the rate of feed by the mechanical means set forth, so as to feed the lumber to the saw more rapidly during the first half of a cut, when the saw has the highest velocity, and slower during the latter half of a cut, in order to keep the saw constantly at a uniform velocity. 2d, The use of the two carriages, operating in the particular manner described, for the purpose of cutting alternately on both sides of the saw, thus keeping the saw constantly at work, and preventing the loss of time or power whilst the lumber is returning with the carriage to be ready for the next cut. 3d, I do not claim the concavo-convex saw, or the planes upon its surface, as separate mechanical devices; but, I claim the concave saw and the planes, in combination with the saw carriage for giving rake to the saw, and for sawing and planing shingles at a single operation. 4th, The arrangement of springs, the head blocks, and the spreaders, for alternately holding and dropping the shingle block.

262. Machine for Heading Bolts; B. C. Vanduzen, Cincinnati, Ohio.

Claim—The arrangement and combination of the adjustable spring fork rod, lever, upper lever, and heading die, as described, for the purpose of regulating the movements of the lever and die, and controlling the size given to the head of the bolt.

263. Odometer; Haskel Walker, Hartford, Assignor to self and B. P. Driggs, Fairlee, Vermont.

Claim—The peculiar arrangement of the parts thereof, by which an actuating tooth upon the hub of one of the wheels of a carriage will cause each revolution of said wheel to unerringly impart a small portion of a revolution to the shaft of the odometer, whilst the spring, by its action against the faces of the angular portion of said shaft, will accurately govern and control the movements thereof.

264. Construction of Saw Teeth; W. A. Wilson, Berlin Falls, New Hampshire.

Claim—Combining the planing with the sawing tooth, so that the cutting edge of the former shall be in rear of, and at about right angles to, the back of the latter, having the throat between, as set forth.

265. Brick Machine; William Wood, Hartford, Connecticut.

Claim—The arms, in combination with the slides, provided with the lever and tappet for operating the moulds, as described.

266. Pot-hole Covers for Cooking Stoves; L. E. Clow, Assignor to C. H. Ramson & Co., Albany, New York.

Claim—A cover or division plate, constructed of two perforated plates and the unperforated rim or ring, as set forth.

267. Iron Railroad Cars; Joseph Davenport, Assignor to self and C. M. Russell, Masillon, Ohio.

Claim—The combination with the platform or bottom of a railroad car, of a laterally and longitudinally supporting truss brace, when said brace consists of a four-sided frame, a series of transverse ties, and transverse diagonal braces, a central longitudinal skeleton or diagonally braced girder, and bearing plates or shoes, as set forth.

268. Mole Plough; W. P. Goolman, Assignor to self, S. B. Morris, and W. Hollingsworth, Dublin, Indiana.

Claim—The arrangement of devices for producing or preventing lateral curves in a drain by adjusting the presentation of the mole independently of the point of a draft.

269. Water-closet; Darius Wellington, Assignor to C. A. Wellington, Boston, Massachusetts.

Claim—The arrangement and combination of the hollow valve rod perforated at d d, cap, basin, pipe, tube, and reservoir, as described.

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270. Railroad Car Trucks; T. F. Allen, Dyersville, Iowa.

Claim—A car truck, sustaining the weight of the car body upon the centre, in a manner to balance or keep it in equilibrium, and free from contact with the side timbers of the truck frame, whatever be the motion imparted to it, and yet provide but the one common axis or bearing for it to turn upon.

271. Apparatus for Destructive Distillation; Luther Atwood, Brooklyn, New York.

Claim—The combination of the vertical distilling tower, and appurtenances, with the condenser and the adjustable draft passage, or their equivalents, in combination, when arranged so as to use the current of heated products of combustion in its upward or natural direction.

272. Hop Frames; Thomas D. Aylsworth, Ilion, New York.

Claim—So hanging the main wire upon the supports, as that said supports will prevent the wire from slipping through them, should it accidentally become loose or broken. Also, in combination with the main wire, suspended as represented, the uniting thereto of the training wires by spring hooks.

273. Farm Gate; George W. Baker, Neponset, Illinois.

Claim—The slide and levers, c c, in combination with the rods, f f, levers, l l, rods, c c, and bars, arranged in connexion with the gate sections, as set forth.

274. Cushion for Billiard Tables; Abraham Bassford, City of New York.

Claim—Constructing the cushion of a billiard table of a metal plate, the edge of which is protected by a thin strip of india rubber, or other suitable substance.

275. Cushion Rail for Billiard Tables; Abraham Bassford, City of New York.

Claim—1st, The arrangement of the cushion rail of a billiard table, in such a manner that a space is left between the bed and the rail, by securing the same to the bed by means of studs and bolts. 2d, The arrangement of the pocket bows, which are made of one piece with the rails, and secured together by a lap-joint, and which are beveled down at their lower edge.

276. Hinge for the Reflectors of Stereoscopes, &c.; Alex. Becker, City of New York.

Claim—The arrangement of the ears, one on each side of the reflector of a stereoscopic case, or attached in a corresponding manner and for the same purpose to any like part of another similar instrument, in combination with the screw.

277. Mode of Preparing and Mounting Slates; Hubbard Beebe, New Haven, Connecticut.

Claim—The combination of a metallic band or rim and vulcanized india rubber frame or mounting, with or without a lining of cloth, to the school slate, whether of stone, slated paper, or wood. Also, the application of the vulcanized india rubber or gutta-percha frame or mounting, substantially in the manner described, without the metallic rim, to slates of stone or other material of sufficient strength and stiffness to warrant its disuse in any case; but I deem it preferable, in all cases, to combine the two, where durability as well as noiselessness are deemed important.

278. Mode of Fastening Skates; Edward Behr, City of New York.

Claim—The arrangement of the screws, b, and the screws, i, or their equivalent, in combination with the toe-cap and with the heel-strap.

279. Mole Plough; Joël Carrington, Avoca, New York.

Claim—The combination and arrangement of a replaceable pointed coulter with a continuous plate or solid standard carrying the mole, and a brace in the rear, connecting the said mole to the beam, and also to the handles.

280. Method of Opening and Closing Gates by Weight of Vehicle; Frederic B. Betts, Brownhelm, Ohio.

Claim—The combination of the roller and its appurtenances with the levers and connecting rods, and with the gate, for the purpose specified.

281. Construction of Mallets; Lyman W. Blanchard, Whittingham, Vermont.

Claim—The mode of constructing mallets with wooden head blocks and iron flanches, and a tapering screw.

282. Carriage Tops; Pardon Boyden, Sandy Creek, New York.

Claim—The arrangement and combination of the bows, E, bars, D D, bars, H H, and seat rail, as described.

[The top of a calash, by this invention, is constructed without folding bows, the frame of the top being perfectly rigid and affixed to centres by means of a single radius bar at each side of the seat or vehicle.]

283. Fastening Skates; John Charlton, Newark, New Jersey.

Claim—The arrangement of the self-adjusting toe-cap, which is attached to the stock of the skate, as specified.

[In the front part of this skate a cap is placed which can be adjusted, by means of slides, to the size of different feet. It is drawn up to the toes by the straps that serve to fasten the skates to the feet.]

284. Billiard Table Cushions; Hugh W. Collender, City of New York.

Claim—Making cushions for billiard tables of what is known as the soft compound of vulcanized india rubber, faced with what is known as the hard compound of vulcanizable india rubber or allied gum, united in the green or plastic state, and together subjected to the heating process for vulcanization.

285. Submarine Telegraph Cable; James M. Connel, Newark, Ohio.

Claim—The introduction of the smooth surfaced wrapping between the coil and the insulating covering, and the employment of this last covering as a core for other wires.

286. CHEESE-PRESSES; Samuel Cope, Enterprise, Illinois.

Claim—Graduating the force of a hydrostatic cheese-press by drawing the water slowly through the stop-cock, as described.

287. APPARATUS FOR SOUNDING HOUSE BELLS, &c.; Joseph Corduan, Brooklyn, New York.

Claim—The arrangement of the three separate springs, in combination with the two tubes and escapement bolt, as described.

288. PILE-DRIVER; Waldo P. Craig, Newport, Kentucky.

Claim—1st, The application and arrangement of the guides attached to their upper ends by universal joints to the frame, and at their lower ends, sliding in apertures in a collar adapted to fit over the end of a pile, and follow the same in its descent. 2d, In combination with the above, the turn-table, constructed as set forth.

289. SAWING MACHINE; Wm. H. Crittenden, Grafton, Ohio.

Claim—The manner of arranging the compensating levers and rods, in combination with the straining levers, straining rod, adjustable slotted holder, and saw, arranged in the manner set forth.

290. CHOPPING-BLOCK FOR STAVE MACHINES; A. H. Crozier and Cyrus Carrier, Oswego, New York..

Claim—The grooved metallic chopping-block, constructed as described.

291. SEEDING MACHINES; F. M. Davis, Footville, Wisconsin.

Claim—The arrangement and combination of the caster wheel, lever, spring rack bar, pinion bar, pinion, rod, slide, and share, as described, so that when the bar is thrown back and lever is depressed, the bar will carry the pinion out of gear with wheel, and thus render the seed slides inoperative, while the front part of the machine will be lifted on the caster-wheel, and the share raised out of the ground.

292. PICK HANDLE; James E. Emerson, Sacramento, California.

Claim—The iron heading of a handle fitted to the under side of a pick, or other instrument, by means of a pin and hole on corresponding plane surfaces, or a swelling and hollow, corresponding to each other, and securely fastened thereto by means of a stirrup extending over the pick, or other instrument, and secured to the handle by means of a key and wedge, which will, by such combination, form a durable and permanent mode of fastening handles on picks, or other instruments, without eyes therein.

293. BEDSTEAD FASTENING; Elisha E. Everett, Philadelphia, Pennsylvania.

Claim—A plug fastening, consisting of the two plug pieces, arranged in combination with the post and rail of a bedstead, in the manner specified.

294. TANNING HIDES AND SKINS; Thomas Fergusson, City of New York; patented in France, Aug. 10, 1858.

Claim—The method described of impregnating hides or skins with the required liquid, by subjecting them to the action of a current of the liquid under a sustained and regulated pressure, after they have been deprived of air by a preliminary exhaustion.

295. STOVES; Francis Gilliland, Port Jackson, New York.

Claim—In combination with the lining and sheet metal case, the cylinder, placed within the body of the stove, and provided at its top with the register or sliding band, and a register or slide on its flanch.

296. TOOL FOR CUTTING METAL; L. F. Goodyear, New Haven, Connecticut.

Claim—The arrangement and combination of the adjustable wedges, cutters, and ring, as described.

297. GRIDIRONS; Wm. A. Green and John G. Treadwell, Albany, New York.

Claim—The check-plate attached to a stove gridiron, when the same is constructed in the manner set forth.

298. MACHINES FOR PEGGING BOOTS AND SHOES; Alpheus C. Gallahue, North East Centre, New York.

Claim—1st, Forming the rack bar of two parts, arranged so as to be lengthened and shortened, to compensate for different length of shoes. 2d, The adjustable or swinging plate, in connexion with the inclined planes, or an equivalent device, for actuating the plate. 3d, The inclined peg gauge in connexion with the peg or feed-box, so as to gauge the pegs from their lower ends. 4th, The vibrating socket in connexion with the plunger rods, arranged in the same slide bar. 5th, The bar, provided with the shoulder or bearing, and rendered capable of being operated, when necessary, by the adjustable yoke and cam, for the purpose of duplicating the row of pegs when required. 6th, The combination of the swinging bed-plate with a rack, arranged as set forth.

299. REVOLVING RETORTS FOR DISTILLING COAL OIL; James Gillespie, Freeport, Pennsylvania.

Claim—Securing the hopper-like cup in position by means of the pins, or their equivalents, surrounding the exit journal of each retort, the square-headed shaft passing through a hollow journal at the opposite end of the retort, and the external plate, as described.

300. PROTRACTOR; Charles Gordon, Washington City, D. C.

Claim—The base, the meridian limb, the vernier, the arc, and rulers, with the clamping screw, arranged as specified.

301. METALLIC PEN-HOLDER; Albert Granger, City of New York.

Claim—The holding of a pen on the outside of a metallic tube (commonly called a pen-holder,) in such a manner, by reason of pierces, cracks, and indentations, as to leave the entire length of a pen, when inserted in proper writing position, uncovered.

302. HOSE COUPLING; Smith Groom, Troy, New York.

Claim—The arrangement of the notched lugs and wedge-shaped flanches, for conjoint operation upon the outside of the fixed part and movable ring of the two halves of the coupling. And in combination with the lugs and flanches arranged upon the coupling for conjoint operation, I also claim the ratchet teeth and catch, when arranged upon the two halves of the coupling, as described.

303. PLOUGHS; Wm. J. Griffies, Marietta, Georgia.

Claim—The arrangement of the stock, forked and slotted foot, screw, shovel, brace, wedge, beam, and handles, constructed as set forth.

304. WATCHMAKERS' LATHES; Elijah Harris, Princeton, Illinois.

Claim—The standard, F, with rimmer, the standard shown at fig. 3, and the standard shown at fig. 4, with dovetail slide, the extra slide head, in combination with the standards and the slide tongs, as described.

305. Corn Planters; Jacob Haynes, Cameron, Illinois.

Claim—The hinged shoe formed with a serrated plate and with the wings, in the manner described. Also, the combination of the movable seat with and supported by the hinged radius bars, and by the sliding bars, for the purpose of enabling the driver to raise or lower the front end of the machine, in the manner described.

306. Rocker-boxes for Saw Shafts; Rufus S. Lee and Wm. D. Leavitt, Cincinnati, Ohio.

Claim—So connecting the inner to the outer box through the medium of a spring, as that said inner box or bearing may have end motion in the outer one against the action of said spring, as described. Also, in combination with the elastic or spring connexion between the inner and outer box, the rollers for the inner box to move on.

307. Grinding Mills; Francis M. Hemphill, Newport, Kentucky.

Claim—1st, In combination with an adjustable bridge tree, the spindle, confined below to the tree and hinged above to the cup-formed, driving, and feeding ryne, having a hinged attachment to the runner, and enabling a discretionary increase of the stress of the runner on the grain by the lighter screw operating wholly from below. 2d, The described arrangement of the cup-formed driving and feeding ryne, gudgeons, bolts, sleeves, and metallic eye, having the described connexion with a runner and spindle respectively. 3d, The cup-formed, driving, and feeding ryne, having the described or equivalent hinged attachments to the spindle and the runner respectively, and operating as set forth. 4th, The frame, A B C, constructed as set forth.

308. Insulator for Lightning Rods; Russel Hickok, Fort Edward, New York.

Claim—A lightning rod insulator made in one piece, so as to support and insulate the rod, and also leave open spaces for water to pass through it, and for air, when suddenly expanded, to escape from within it.

309. Churn; Gardner P. Hopkins, Cabot, Vermont.

Claim—The construction of the churn so as to combine the rotary motion of the barrel with the up-and-down and rotary motion of the dashers, and so to prevent the cream from acquiring a circular motion in the process of churning.

310. Making Moulds for Casting; Robert Jobson, Wordsley, England; patented in England, May 3, 1856.

Claim—Constructing the table platform or bed, so that it may turn on or about necks or axes, as described.

311. Harvesters; Henry R. Keese, Bridport, Vermont.

Claim—1st, The employment of a hinged supplemental frame, in combination with the main frame and driving wheel, when the said frame is provided with an adjustable bearing wheel, or its equivalent. 2d, The combination of a driver's seat with the supplemental frame and driving wheel, so that, by lateral change of his position, the driver may elevate or depress the cutters or diminish the traction, and otherwise balance and govern the machine. 3d, Hinging the supplemental frame to the main frame, as set forth.

312. Breech Loading Fire Arms; Edw. Lindner, City of New York.

Claim—1st, The method described for operating or closing the breech, and forming a tight joint at the junction of the barrel with the breech, by the employment of a screw ferule or sleeve, fitting an outer screw thread on the barrel, and provided with a projecting annular flanch for grasping and releasing the breech, and for drawing the same backwards and forwards in the direction of the barrel, to or from the rear end thereof, upon said screw-threaded sleeve. 2d, In combination with a movable box within the breech, constructed as described, the packing thereof by means of asbestos, or its equivalent. 3d, Locking the screw-threaded sleeve that operates the breech, by forming the pivoted lever which serves to turn said sleeve with an eccentric or cam, arranged to act upon a locking pin by pressing down said lever after the breech is drawn tight, as set forth.

313. Portable Writing Desks; Wm. H. Lochman, York, Pennsylvania.

Claim—The mode and manner of uniting the different parts of a writing desk by hinges, or their equivalent, so as to admit of its being folded up into a comparatively small space.

314. Life-boat; Matthias Ludlam, Fair Haven, Vermont.

Claim—Providing the exterior of the boat with adjustable side-floats, constructed and hung, or arranged to operate in, or at different fixed positions or distances, to or from the sides of the boat. Also, providing either float, arranged along the outsides of a boat, with an open or trellis-work railing made to project below the float.

315. Expanding Auger; Charles Meyer, Fond du Lac, Wisconsin.

Claim—An expanding auger, constructed and operated substantially as described.

316. Corn Planters; John G. Mitchell, Collington, Maryland.

Claim—The combination of the swinging hopper, constructed and arranged as described, with the adjustable coverer and dropping tubes.

317. Harvesters; J. A. Moore and A. H. Patch, Louisville, Kentucky.

Claim—1st, The enlargement of the curved slots of the standards, as set forth. 2d, The arrangement relatively to each other of the vertically perforated curved stop bar, slide, and lever, for the purpose set forth.

318. Preserve Cans; Samuel Morritt, West Pennsboro', Pennsylvania.

Claim—The covering of fruit cans by means of the concave cover, when the same is constructed as described, and retained in place solely by atmospheric pressure.

319. Apparatus for Cleansing Bristles; Henry W. Mosher and Joseph A. Conboie, City of New York.

Claim—The rotating bristle clamps placed within a cylindrical box or case provided with diagonal plates, and used with or without the brush and soap bar, or other cleansing substance, as set forth.

320. Hay Mangers; John Packer, Philadelphia, Pennsylvania.

Claim—Combining with a hay manger a falling rack, to prevent the horses from pulling out and unnecessarily wasting the hay therein.

321. Ventilating Vault Cover; John Patrick, City of New York.

Claim—The perforated plate and gutter, in combination with the metallic roof, ceiling, or walk, for forming a ventilating space and catching any water of condensation, in the manner specified. And, in combination therewith, the ventilating pipe, as specified.

322. Machine for Bending Tire; Wm. Patterson, Constantine, Michigan.

Claim—1st. Connecting the clevis to the lever and segment in such a manner that the lever will cause the clevis to grasp and release its hold on the bar to be bent, independently of and before said segment commences to move. 2d, Providing the outer end of the clevis with an arm, so arranged in relation to the circumference of the segment as to bear against the outer side of the tire, and support it (while being bent) above the end of the segment, thereby preserving the circle of the tire by preventing it from springing back during the descent of the lever. 3d, Making the clevis adjustable for the purpose of adapting it to the use of different sized segments in the same machine.

323. Hoop Machine; Henry C. Peirson, Philadelphia, Pennsylvania.

Claim—The arrangement of the series of bending rollers, or their equivalents, in rear of the cutter, or its equivalent, so as to operate upon the hoops in the manner specified, as the said hoops pass between them directly from the said cutter.

324. Railroad Coupling Chair; R. S. Potter, Chicago, Illinois.

Claim—The use of two wedges or keys, in combination with a railroad chair, when the outer lip of said chair is overhung in the manner described, and its inner surface is of a conoidal form, as specified.

325. Seed Planters; D. R. Prindle, Bethany, New York.

Claim—1st, Hinging the frame that carries the seeding devices, and the beams that carry the furrow opener and coverer to the axle. Also, in combination with the axle and hinged frame and beams, the tongue and lever, for raising and lowering or controlling the planting and covering devices. Also, the adjustable hinged clevis irons, arranged as set forth. Also, the combination of the curved spring plates and spring, as applied to the seeding wheels or cylinders, for the purpose explained.

326. Cloth Frames; Daniel Read, Hamilton, New York.

Claim—The combination and arrangement of the standard with the arms, the standard, i i, and braces, as specified.

327. Machinery for Filling Loom Harness Needles; L. L. Reynolds, Manchester, New Hampshire.

Claim—The hooks, or the equivalent thereof, for depositing the twine or cord upon the outer sides of the score of the needle, when combined with a device for delivering the twine or cord to said hooks. Also, in combination of the intermittent rotating oval-shaped pin with the cam, or their equivalents, for depositing the twine or cord evenly around the end of the needle.

MECHANICS, PHYSICS, AND CHEMISTRY.

*On a Universal Printing Press.** By T. J. Silberman, Jr.

A press on this principle, and adapted to all kinds of printing, has been patented by Mr. Silberman, pupil and assistant in physics to the late M. Savart, and to M. V. Regnault, at the College of France.

Pascal's law is this: "Whatever be the amount of pressure brought to bear upon any point in a contained fluid mass (whether the fluid be a liquid, or steam, or gas), this pressure is distributed with perfect and entire equality among all parts of the mass, and consequently with perfect equality over all parts of the surface of the vessel which contains the mass;" so that if this vessel or a portion of it be pliable and elastic, it will communicate the same pressure which it receives to paper, cloth, or any other similar substance, laid upon an unyielding engraved surface. And the invention consists in printing by thus applying the pressure of a fluid to a yielding surface laid against an unyielding engraved surface; and this whether the surface printed be that of the vessel itself, which thus becomes the press,—or whether it be communicated to another interposed yielding surface from the pliable and elastic side of the vessel, so as to print plane, curved, or angular surfaces,—or whether the material to be printed be paper, felt, textile fabric, caoutchouc, leather, bladder, ceramic paste, or glass, crystal, or enamel softened by heat,—or whether it be used for the purpose of peripheric printing, as in the printing of terrestrial and celestial globes, of vessels of glass and earthenware,—or as a modification of the presses in use for other kinds of printing.

* From the London Civ. Eng. and Arch. Jour., December, 1858.

The application of this principle to the peripheric printing of globes, and of vessels of glass and earthenware, is the subject of a separate paper. At present let us consider merely its application to printing upon plane surfaces, as well as the different modifications it admits of, so as to suit the different kinds of printing; and lastly, of its peculiar advantages over other methods.

The following are some of the methods in use for the practical application of the principle:

1. A strong shallow basin of tough metal is required, with a triple stop-cock at bottom, admitting at pleasure the sort of fluid intended to be used, whether it be atmospheric air, steam, or (when great pressure is required) water, with hydraulic pressure. This basin is filled with water, and covered by a tympan formed of a sheet, or of several sheets thick, of caoutchouc firmly clasped at the edges in an iron frame. A movable plate of iron strengthened by stays is attached by strong hinges to one of the edges of the tympan frame. This plate, when shut down upon the surface of the tympan, forms the unyielding portion of the press, and supports the engraved plate against the substance intended to be printed, which receives by means of the tympan the pressure produced upon the water at the bottom of the basin.

In order to retain this plate firmly in its place upon the tympan, its edges as well as those of the basin should be beveled in such a manner as to lock the whole way round in a collar with a corresponding groove; this collar opens and closes upon the edges the whole way round by means of two hinges and wide-threaded strong screws, or else by means of a cam or eccentric lever lock. A very simple contrivance compels regularity in the proceeding, and prevents accidents, by locking the stop-cock, and preventing the admission of pressure into the basin, until after the plate shall have been shut down and firmly locked upon the tympan.

The engraved plate may either be permanently fastened upon the iron plate, or it may be run into its place in a groove, so as to admit of being easily removed and replaced after each impression, as in the case of copperplate printing.

When it is intended to print paperhangings or cloth with dies, an iron frame instead of the solid plate above described is attached to the hinges; a strong iron axle passing through gudgeons on opposite sides of the frame carries a panel fitting into the frame, and upon this panel the die is fixed. The panel thus revolving completely on the axle at the same time that the frame is raised upon its hinges to a vertical position, admits of the face of the die being alternately brought in contact with the tub, when it is charged with color, and with the surface of the material intended to be printed.

2. Another form of the press is one in which the tympan is movable upon hinges, and fastens down upon the plate, which in this case is the fixed part of the press, and upon it the die is laid. In lithography or typography there must of course be a hollow in the plate corresponding to the thickness of the stone or type used.

This was the form adopted for the first experiment with the press,

its tympan consisted of two sheets of vulcanized caoutchouc fastened to the basin, and secured by strong screws; the tympanum and the plate, instead of being locked together while the pressure was on by means of the collar above described, were kept together at one end by the hinges, and at the other by a cam or eccentric lever lock, working from an iron arch like a common letter-copying machine, and to which two movable claws are attached, which, when the lever is worked, grasp and secure the ends of a strong bar across the centre.

3. It may sometimes be desirable to place the press vertically, notwithstanding the slight, and in fact almost imperceptible difference in the pressure at the top and at the bottom of the basin, and which is produced by the column of water in the basin itself. When air is used this inequality is absolutely imperceptible, but on account of the great compressibility of air a much larger quantity of air must be admitted than when water is used; for instance, if the basin is one metre square and one millimetre deep, and consequently holds one litre, it will require one litre of air to produce a pressure of a single atmosphere, and ten litres to produce a pressure of ten atmospheres.

The vertical position is particularly well suited for very large plates, say five or six feet square; the copperplate can if necessary be heated from behind, and the workman can apply the ink in a standing posture. The press in this case would open like a door, and large presses thus arranged would occupy but little space, would be easily worked, would render the application of the ink less fatiguing, and would save rent in office space, for six vertical presses take no more room than two horizontal presses. In this way the printing of very large maps will become not only possible but cheap.

As to the purposes to which it can be applied:—1. It is equally suitable to all kinds of ordinary printing, whether copperplate, lithography, typography, paperhangings, or wood engraving, for it fully admits of the depth of shade in certain parts of the engraving being modified according to taste, without altering the engraving by the usual contrivance of folds of paper cut out so as to throw the part into suitable relief. 2. It is peculiarly suitable for polychromic printing, whether typographic, lithographic, or copperplate, and the pressure being only in a vertical direction, the paper or cloth is not liable to be altered in size or form by the pressure, and admits of accurate fitting to the guide pins as often as the number of colors used may require. 3. It is equally suitable for printing upon all sorts of material, whether paper, cloth, ceramic paste, felt, leather, or caoutchouc. 4. It prints with a single impression very much larger plates than it has heretofore been possible to do, and it ensures the color being uniform over the whole surface. 5. It admits of being used for stereotype and other casts from ordinary printing type, and does not require that frequent touching with the brush which wears away the characters so quickly.

As to the pressure:—1. The pressure being that of a fluid communicated through a uniformly yielding surface, will be absolutely equal at every point of the surface, consequently there will be no danger of partial pressure on the plate, nor need there be a pressure upon any

part of the plate beyond what is necessary, so that the maximum result is thus obtainable with a minimum of pressure. 2. Any amount of pressure required can be easily obtained. 3. The amount of pressure can be ascertained with precision (for instance, by Bourdon's metallic manometer), and diminished or increased to the exact extent which may be required. 4. Perfectly plane surfaces are no longer the only surfaces capable of being printed. 5. Convex or concave surfaces can thus be printed.

As to make, form, and size:—1. The press is extremely simple in its construction; almost all the pieces are cast exactly as they are used, and require very little fitting. 2. It can be made of any strength required. 3. It requires no troublesome alterations when the purpose for which it is used is altered. 4. It fits in a very small space, being only four or five inches wider than the printed sheet, whereas the presses hitherto in use are at least four times wider than the printed sheet. 5. It thus admits of being worked in a small and comparatively inexpensive office. 6. Its size being so small, a printer can have several presses of different sizes in his office, so as to be no longer forced to use his large presses for small sheets. 7. It is easily taken asunder and moved. 8. It is on this last account, and the almost impossibility of breakage, admirably adapted for exportation.

As to its working:—1. It requires hardly any effort, and entirely dispenses with the severe labor which the winches and pedals of the present lithographic press requires,—with the rolling of copperplate printing,—with the difficulty of charging the blocks with color, as well as with the danger of working the huge lever of the ordinary press in printing paperhangings; and as it requires less exertion on the part of the workmen, it gives them more time to attend to the quality of the work, and thus tends to elevate their character. 2. A much greater number of impressions can be taken in a given time than was possible heretofore. 3. The manner of using the press can be learned in an hour. 4. No modification of the press, or any of its parts, is necessary when a change is made in the size of the sheet, or otherwise in the nature of the work to be printed. 5. The impression is uniformly even and invariably successful. 6. There is no longer any danger of distorting nor of lengthening by rolling out the plates in copperplate printing,—nor of breaking the lithographic stones by the uneven pressure of the scraper. 7. The simplicity of the contrivance for locking the press, and for admitting and shutting off the pressure, renders all mistakes impossible. 8. There is no part of the press which is expensive from excessive wear and tear; and even when worn out, both the caoutchouc and the metal have a considerable value as raw material.

As an investment, the great simplicity of the machinery, and the small expense of fitting, will allow the press to be sold extremely cheap.

As to the sort of pressure to be used,—steam pressure may be adopted, or the pressure of expanded or condensed air, the hydraulic press, the screw, the cam, or the eccentric or knee lever lock. If steam is used, the waste heat will warm the plates in copperplate printing,

and will thus get rid of the charcoal dust, so injurious to the health of the workmen.

The expenditure of water or steam may be estimated by considering the surface of the caoutchouc as the surface of a piston, and its depression joined to that of the printed surface as the stroke of the piston; consequently, when the basin is one metre square, there is an expenditure of one litre of air or water for each millimetre in the depression of the surface.

Water appears on the whole the most desirable agent, on account of its non-compressibility and of the small quantity required in order to produce very considerable pressure, as also on account of its non-expansibility, which prevents the possibility of an explosion, for if any breakage takes place the water simply runs out. In experiments which were made with a pressure of from 20 to 30 atmospheres, before perfecting the press, the vessel repeatedly burst with no greater injury to those engaged than a few splashes on their clothes.

Coloring Matters.

In view of the excitement which has recently ensued upon some reported cases of accidental poisoning from the use of arsenical colors on stuffs and paper-hangings, M. Salvetat calls attention to the possibility of producing cheap and permanent greens, pinks, and violets from common metals. He enumerates the following:

Chrome-greens—Prepared by calcining together the sesqui-oxide of chromium, hydrated alumina, and the carbonate of cobalt in an oxidizing atmosphere. The proportions vary with the color desired. Blues may also be obtained in the same way.

Hydrated Oxide of Chrome.—This magnificent color has long been used by the painters under the name of *emerald green.* It is also sometimes called *Pannetier-green*, from the name of its introducer. The following mode of preparing it has been patented in France by M. Guignet:—Calcine, carefully, to redness a mixture of bi-chromate of potassa and crystallized boracic acid; a green mass is obtained which is a borate of chromium and potassa. In contact with water this salt decomposes; boracic acid dissolves, and the hydrated oxide of chrome remains precipitated. The proportions recommended are 10 parts by weight of the crystallized acid ($BO^3 \cdot 3HO$,) to 3 parts of bichromate $KO \cdot 2C \cdot Or^3$, which by theory should give 2 parts by weight of the hydrated oxide.

The tone of the color may be varied by the mixture of alumina. The tone of the emerald green corresponds to green 4, 12th tone of the 1st chromatic circle of M. Chevreul.

Cobalt-Pink, and-Violet.—When a solution of a cobalt-salt is precipitated by the phosphate of soda, we obtain a pink-salt of a very beautiful tint, which, when simply dried in the air, corresponds to 1st red-violet, 5th tone of the 1st chromatic circle of M. Chevreul. It is known that under the influence of heat the oxide of iron takes a tint

which varies from orange to blue-violet, according to the temperature to which it has been exposed. The phosphate of cobalt presents a similar property; and according to the temperature to which it has been exposed, its tone varies from red-violet to the 2d blue-violet. We may thus obtain any intermediate tint from the 3d violet-blue to the 5th violet and red-violet. The violet, 11th tone, corresponds to the fused phosphate of cobalt. The 4th violet-blue, 10th tone, corresponds to the aluminate of cobalt and chrome. These tints will be purer in proportion as the heat has been uniform throughout the whole mass.

As the oxide of cobalt may now be obtained at a reasonable price, it is to be hoped that these new mineral colors may be serviceable for printing on stuffs and paper, and especially for the preparation of fine colors for painters.

Nickel-yellow.—The phosphate of nickel, which, when merely dried at ordinary temperatures, is of a greenish-white color, becomes yellow by exposure to a red heat. This may give us a new fixed yellow for similar purposes.—*Academy of Sciences of Paris, Feb.* 7, 1859.

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*On an Expanding Pulley for Obtaining Variations in the Speed of Machines with facility.** By JAMES COMBE, Belfast.

A pretty correct idea of this pulley may be formed by supposing two cones cut with radial spaces alternating with solid parts, so that the solid parts in one may slide freely into corresponding spaces in the other, in the direction of a common axis. The sizes of these radial sections are regulated so that when the two cones are put together they form a grooved or V pulley, the diameter of which varies according to the position which the cones occupy with regard to each other. This will be at once apparent by an inspection of the engravings. It will also be seen that any desired amount of variation in size may be got, and this without involving the necessity of occupying a large space. This change in size is made by pressing the one into the other, which can easily be done whether the pulley be in motion or at rest. The value of the property of giving readily any amount of change in size will be made evident by a comparison of the results obtainable by a pair of common cones and a pair of expanders of similar dimensions, and giving the same extremes of speeds.

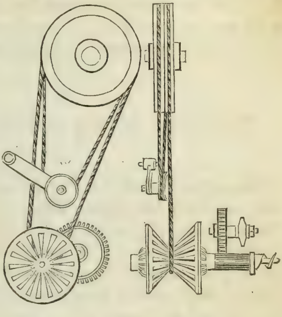
A range from 1 to 4 in diameter (or more if necessary,) is easily obtainable in the expanders, and, supposing the one which drives to have a speed of 80 revolutions per minute, and that it be set at 4 ins. diameter, and the one which is driven to be set at 16 inches diameter (the corresponding position), the speed of the latter will be one-fourth of 80, or 20 revolutions per minute.

When the driver is changed to 16 inches in diameter, and the driven to 4 inches, the speed of the driven shaft will be increased to 320 revolutions per minute.

The changes between these extremes (20 and 320,) may be of any

* From the London Mechanics' Magazine, October, 1858.

extent or per centage on the speed, and they can be made as gradually as is desired without stopping. For comparison with this, take a pair of common cones, having the same extreme diameters, and having steps of two inches, which is not more than usual. When the driving strap is changed from the steps on the cones which give the slowest speed (that is, 20 revolutions per minute) to the next steps, which is the smallest change that can be made, the speed of the driven is increased to 34 revolutions per minute, that is, 70 per cent. on the former speed. The change to the next steps makes the speed of the driven 53, and the increase here is 56 per cent. The third change increases it to 80, or 51 per cent.; the next to 120, an increase of 50 per cent.; then to 186, by an increase of 55 per cent.; and, lastly, to 320, by an increase of 72 per cent. All these changes in speed are great, and, although in practice mechanics have become accustomed to them, and don't think of the loss, it is quite clear that a great waste of time must result from not being able to get smaller changes readily. For instance, suppose that a lathe or boring machine has a piece of work in it of a diameter that would require a speed between any of the speeds which the steps of the common cones give, but which will not bear the whole step; it is quite clear that in this case a loss of time and work equal to 50 or 60 per cent. may take place. To get over the difficulty attending the use of common cones, some tool-makers use two pairs of driving pulleys on the counter shaft, which of course doubles the range of the cones; but this is a cumbrous arrangement, and is still very far from giving what is necessary or desirable. There are many machines in which a variation of speed is desirable, and would be used if it could be got readily; but there is often such a loss of time involved in making a change that very much slower speeds are used rather than take the trouble or incur the delay of making that change. The common cones referred to are not by any means an extreme case; on the contrary, it is quite common to make the steps even greater, and, if the number of steps be less and the extent of the range smaller, there is of course a corresponding diminution in the adaptability of the machine to different purposes.



The expanding pulley was first brought out for the purpose of giving the varying motion to the bobbins in flax and tow roving frames, to which it is applicable with great advantages, from the accuracy of its action and the small space which it occupies. By its use a very simple and correctly working machine is got, capable of making bobbins either in the ordinary way or in cops. It is equally applicable to the heaviest and the lightest frames.

The cop is from a tow roving frame, and is made of rove weighing

1 lea (or 300 yards) to the ℔. The bobbin is filled with flax rove of 40 leas (or 12,000 yards) to the ℔.

On the machines on which this bobbin and cop were filled only one expander is used, and the band is kept at the necessary tension either by making the expander swing in a frame or by the use of a stretching pulley.

A very simple mode of applying a stretching pulley is to make the pulley, which does not vary, with two grooves or V's, and pass the band twice round it, putting the expander in one fold, and the stretching pulley in the other. These arrangements are applicable to many other purposes. Where two expanders are used, one to drive the other, it is not necessary to have any stretching pulley, but simply to connect one or both sides of each pulley with levers, so that they may be moved simultaneously as required.—*British Association*, 1858.

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*Electro-zinc Deposits on Engraved Copperplates.** By Henry Bradbury.

M. Louis Figuier, of Paris, through the instrumentality of my friend and *confrère* M. Henri Plon, the eminent printer and publisher of Paris, having recently, in the columns of *La Presse* newspaper, made mention of my mode of surfacing engraved copperplates with a coating of pure zinc by electro-metallurgical means, for the purpose of protecting such plates from wear while printing, and which coating can be removed and renewed at pleasure with facility, and without injury to the engraved plate, I beg leave to introduce the particulars of my mode, for the benefit of those interested in extending the application of the galvano-plastic art.

To obtain a deposit of pure zinc capable of printing from 1500 to 2000 impressions, or more, before requiring to be removed and renewed, I have recourse to a combined solution of chloride and cyanide of zinc, prepared as follows:—

Chloride of Zinc Solution.—In a suitable vessel dissolve one part chloride of ammonium in eight parts water; place in this a porous cell containing the same solution and a copperplate, which attach to the zinc of a Smee's battery, and in the outer cell place a plate of spelter, which attach to the silver of the above battery for 48 hours.

Cyanide of Zinc Solution.—Dissolve ½℔. of cyanide of potassium in twelve parts of water; then add as much chloride of zinc as the solution will take up.

Mix these solutions together in equal parts; use a zinc positive pole and one of Smee's compound batteries, intensity arrangement, charged with one part of sulphuric acid to twelve of water.

In from 45 minutes to an hour a deposit of the most beautiful lustre will be obtained, capable of yielding from 1500 to 2000 impressions, and even more, according to the experience of the manipulator.

Whitefriars, February 3, 1859.

* From the Journal of the Society of Arts, No 324.

*Electro-zinc Deposits on Engraved Copperplates.** By F. JOUBERT.

Your last number contains a letter from Mr. Henry Bradbury, describing a process for covering an engraved copperplate with a deposit of zinc, in order to protect it from wear while being printed, and it is stated such a deposit will yield from 1500 to 2000 impressions.

This is an imitation of the process for covering engraved copperplates with iron before sending them to press, originally introduced in Paris under the name of "Acierage," for which I hold an English patent, taken out last year, and which process I had the honor of describing before a full meeting of the Society of Arts, in a paper read on the 24th of November last.

It is a well known fact that zinc, in a pure state, is even softer than copper, and, moreover, it has a natural tendency to retain the printing ink instead of giving it off freely, as steel and its basis, iron, will do. Every printer who has had zinc plates to work from can testify to the very limited number of good impressions which are obtainable from zinc plates, sometimes used for maps, plans, &c.; whereas the metal I use, as described in the specifications of my patent, is capable of yielding 10,000 impressions and upwards before the first coating shows signs of wear. This was exemplified at the last meeting of the Graphic Society, where I exhibited several engraved copperplates, forming part of a work shortly to be published, some of which had already produced 10,000 impressions, and this with one coating, without any perceptible difference between the first and the last impressions which I had sent with the plates.

Such a result will, I hope, establish in a satisfactory manner the superiority of the one metal over the other; for zinc cannot by any possibility compete with the harder metal—iron, which seems to acquire, by being deposited through galvanic agency, a power of cohesion and resistance much beyond that which pure iron possesses, and very nearly equal, for printing purposes, to the best steel used in the trade for making steel plates.

Porchester-terrace, February 10, 1859.

* From the Journal of the Society of Arts, No. 325.

Action of Hydrogen Gas on Metals.

M. Bekatoff, operating in the laboratory of M. Dumas, has discovered that:—

1. Common hydrogen, either as a gas or dissolved, displaces certain metals from their solution in acids. The metals with which he succeeded were silver and mercury.

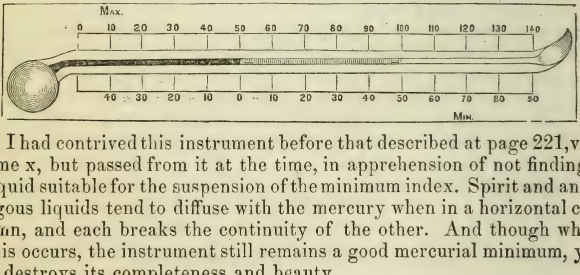
2. This action depends on the pressure of the gas and the dilution of the salt, or in other words, on the relative chemical mass of the reducing body.

3. It is probable that at higher pressures, the experiment will succeed with other metals.—*Academy of Sciences of Paris, February* 28, 1859.

*Notice of another New Maximum and Minimum Mercurial Thermometer.** By John G. Macvicar, D.D., Moffat.

The maximum and minimum thermometer described by me at page 221, volume x, of this journal is not the only one in which mercury may be used to give the minimum as well as the maximum for any interval of time between two successive adjustments. A more elegant instrument, at least for meteorological purposes, may be constructed thus:—

Let a mercurial maximum thermometer of the ordinary Rutherford's construction be taken, and let 50° or 60° in length of a suitable liquid be introduced into the stem immediately above the mercury, and into this liquid let two indices be inserted, first, one which shall obey the magnet, as in Rutherford's maximum thermometer, and then one of enamel, as in Rutherford's minimum. Let the instrument be then sealed in the usual way, and on the plate let two scales be engraved, one taking its points from the top of the mercury for a scale of maximum temperatures, and the other taking its points from the top of the liquid for a scale of minimum temperatures, and the instrument is completed. To prepare for an observation, let the enamel index be brought, as in Rutherford's minimum, to the top of the liquid: then holding or placing the instrument horizontally, let the steel index be brought by the magnet to the top of the mercury. The thermometer is now fit for use. It is obvious that the upper end of the enamel index will give the minimum and the lower end of the steel index the maximum temperature since the last adjustment.



I had contrived this instrument before that described at page 221, volume x, but passed from it at the time, in apprehension of not finding a liquid suitable for the suspension of the minimum index. Spirit and analogous liquids tend to diffuse with the mercury when in a horizontal column, and each breaks the continuity of the other. And though when this occurs, the instrument still remains a good mercurial minimum, yet it destroys its completeness and beauty.

I am now satisfied, however, that a liquid having no diffusive tendency or chemical action between it and mercury, as also a sufficiently low freezing point and high boiling point, may be found. In fact, between twenty and thirty years ago, Mr. Adie, the optician in Edinburgh, merely to prevent oxidation in the tubes of Rutherford's maximum thermometer, introduced above the mercury, naphtha; and I saw the other day one of these thermometers, which, during that long interval had preserved the mercurial column unbroken, and the steel index pure and all right. It is certain, however, that it is not every kind of liquid that passes in commerce under the name of naphtha that will do so. But the

* From the Quarterly Journ. of the Chem. Soc., July, 1858.

fact that a hydrocarbon was found which has continued to function well for a quarter of a century, shows that a suitable liquid may be found.

Residing, however, as I do, among the mountains of Scotland, far away from all facilities for accurate experiments, I must leave further determinations to those who are more favorably situated for such inquiries.

For the Journal of the Franklin Institute.

Particulars of the Steamer Pei-Ho.

Hull built by Thomas Collyer. Machinery by the Morgan Iron Works, New York. Owners, J. M. Forbes & Co. Intended service, China Seas.

Hull.—

Length on deck,	225 feet.		
Breadth of beam, (molded,)	32 "		
Depth of hold,	9 "		
" to spar deck,	16 "		

Frames—*molded*, 12 inches, *sided*, 14½ inches; apart at centres, 29 inches, and strapped with diagonal and double-laid braces $4 \times \frac{1}{2}$ ins.

Keel—Depth, 9 inches.

Independent steam, fire, and bilge pump—one—and boiler.

Bulkheads—two.

Draft of water, forward and aft, . . 11 " 6 "

Tonnage, . . 1110.

Area of immersed midship section at load draft of 11 ft. 6 ins., 315 sq. ft.

Masts, two.—Rig—Brigantine.

Engines.— Inclined oscillating.

Diameter of cylinder,	52 inches.
Length of stroke,	8 feet.
Maximum pressure of steam,	25 lbs.
Cut-off,	variable.
Maximum revolutions at above pressure,	22.

Boilers.—Two—Return tubular.

Length of boilers,	18 feet.	
Breadth "	12 "	6 inches.
Height " exclusive of steam chimney,	12 "	6 "
Number of furnaces—	six.	
Breadth of "	3 "	8 "
Length of grate bars,	7 "	
Number of tubes,	above 336.	
	below 32.	
Internal diameter of tubes,	above	3½ "
	below 16 ins., 10 ins. and	14 "
Length of tubes,	above 12 ft.	
	below 3 ft.	11 "
Diameter of smoke pipe,	4 feet	10 "
Height "	32 "	

Paddle Wheels.—

Diameter overboards,	28 feet.
Length of blades,	8 "
Depth of "	18 inches.
Number "	24.

Remarks.—Cabin and state-room on spar-deck. Floors filled in solid. Date of trial, April, 1859.

C. H. H.

For the Journal of the Franklin Institute.

Particulars of the Steamer Indianola.

Hull and Machinery by Harlan, Hollingsworth & Co., Wilmington, Delaware. Owners, Mora Bros., Navarro & Co. Intended service, New York to Havana.

HULL.—

Length on deck,		151 feet.
" at load line,		149 "
Breadth of beam, (molded,)		26 "
Depth of hold,		9 " 9 inches.
" to spar deck,		16 " 9 "
Length of engine room,		40 "

Frames—molded $3\frac{1}{2}\times\frac{3}{4}$ and $\frac{7}{8}$ inches $= 20\frac{1}{2}$ to 15 inches apart from centres. Sketch of shape |. Depth $3\frac{1}{2}$ ins.

Strakes—10 strakes of plates from keel to gunwales.
Diameter of rivets $\frac{3}{4}$ inch. Apart, $2\frac{1}{8}$ ins. Single riveted.
Thickness of plates, $\frac{5}{8}$, $\frac{1}{2}$, 7-16ths and $\frac{3}{8}$ inch.

Cross floors—10 in number, 18 inches high, with $2\frac{1}{2}\times2\frac{1}{2}$ L iron on top.

Bulkheads, three.

Keelsons—8 fore and aft—main, side, and bilge.

Keel—depth 6 inches.

Draft of water at load line,	forward,		7 feet $1\frac{1}{2}$ inches.
	aft,		8 " $4\frac{1}{2}$ "
Tonnage,	Hull,	358 60-95ths.	
	Engine room,	74 10-95ths.	
Area of immersed section at load draft,			160 sq. feet.
Speed in miles,	with tide,	13.	
	against tide,	$9\frac{1}{2}$.	

Masts, two.—Square rig fore—Lugsail, aft.

ENGINE.—One—Direct acting—Condensing.

Diameter of cylinder,		32 inches.
Length of stroke,		2 " 4 "
Pressure of steam,	27 lbs.	
Cut-off,	half stroke.	
Maximum revolutions at above pressure,	70.	
Weight of engines,	64,000 lbs.	

BOILER.—One—Drop return flue.

Length of boiler,		20 feet.
Breadth "		9 " 6 inches.
Height " exclusive of steam chimney,		8 " 6 "
Weight " with water,	62,000 lbs.	
Number of furnaces,	2.	
Breadth "		4 " 1 "
Length of grate bars,		6 "

Number of flues, above 16. below 6.

Internal diameter of flues, above $8\frac{1}{2}$ ins. below 2 of 21 ins., 2 of 17 ins., and 2 of 16 inches.

Length of flues, above 14 ft. 9 ins. below 9 ft.

Heating surface,		1077·26 sq. ft.
Diameter of smoke pipe,		3 " 11 "
Height " from grate bars,		38 " 6 "
Consumption of fuel per hour,	$\frac{3}{8}$ ton.	

PROPELLER.—

Diameter of screw,		8 feet 6 ins.
Length of "		3 " $8\frac{3}{8}$ "
Pitch of "		15 " 5 "
Number of blades,	4.	

Date of trial, March, 1859.

C. H. H.

Objects Rendered Visible in a Fog.

In a communication from Sir Henry* Brewster to the Academy of Sciences of Paris, he says:

"Whilst I was studying the polarization of the atmosphere, I observed this remarkable fact, that when distant objects are rendered indistinct by the interposition of a light fog, a part of their definiteness may be restored by looking at them through a Nicol-prism, which stops all the light which the fog has polarized in a plane passing through the sun, the object, and the eye of the observer. The objects thus made more distinct and visible, were seen through that portion of the fog in which the polarization of the reflected light was at a maximum.

NOTE.—We remember to have seen somewhere, and to have published some years ago, a somewhat similar statement as to the efficiency of a simple plate of red glass to effect this same object. Will not some one who has a good opportunity, try this very simple experiment, which might be of great importance in preventing collisions upon our rivers and harbors during heavy fogs. ED. JOUR. FR. INST.

* The Comptes Rendus, both in the title and in the contents, says Sir Henry, but the nature of the communication itself, as well as its place among those of the members and correspondents of the Academy, show that it is really the distinguished optician, Sir David Brewster, who is the author of the article.

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*The Discovery of the Composition of Water.**

Mr. Bennett, of the British Museum, has addressed a letter to Sir Benjamin Brodie, Bart., which contains indisputable evidence in favor of Cavendish's claim to the discovery of the composition of water. The evidence was discovered by the late Robert Brown, Esq., and is not derived from any unpublished document, but forms part of a section of De Luc's "Idées sur la Météorologie," which, although specially entitled "*Anecdotes Relatives à la découverte de l'Eau sous la forme d'Air*," appears entirely to have escaped the notice of those who have advocated Cavendish's claims. It is the more conclusive as coming from De Luc, the "*ami zélé*," as he justly terms himself, of Watt, and who, in relation to this question, believed himself "à portée d'en connoître toutes les circonstances."

The testimony of De Luc is as follows:—Vers la fin de l'année 1782, j'allai à *Birmingham*, où le Dr. Priestley s'étoit établi depuis quelques années. Il me communiqua alors que, M. Cavendish, d'après une remarque de M. Warltine, qui avoit toujours trouvé de l'eau dans les vases où il avoit brûlé un mélange de *l'air inflammable* et *d'air atmosphérique*, s'étoit appliqué à découvrir la source de cette eau, et qu'il avoit trouvé qu'un mélange *d'air inflammable* et *d'air déphlogistique* en proportion convenable, étant allumé par l'étincelle électrique, se convertissoit tout entier en *eau*.—Je fus frappé au plus haut degré de cette découverte."—*Idées sur la Météorologie*, Tome 2, 1787, pp. 206–7.

The italics and inverted commas are De Luc's own.

In this communication, made by Cavendish to Priestley, the theory

* From the London Athenæum, Feb., 1859.

of the composition of water is clearly indicated. The two gases—known to have been hydrogen and oxygen—were mixed together *in due proportion*, and by means of the electric sparks were *entirely converted* into water. Referring to one of Cavendish's experiments, as recorded in his Journal, Lord Jeffrey, the most candid and judicious of Watt's advocates, has said, "If he (Cavendish) had even stated in the detail of it that the airs were *converted*, or *changed*, or *turned* into water, it would probably have been enough to have secured to him the credit of this discovery as well as to have given the scientific world the benefit of it in the event of his death before he could prevail on his modesty to claim it in public."—*Edinburgh Review*, vol. 87, p. 125.

The evidence which this distinguished critic and judge regarded as sufficient to establish Cavendish's claim is now afforded, not by a note in his private Journal, but by the testimony of the zealous friend of Watt, who states that it was communicated to Priestley towards the end of 1782, that is to say, several months before Watt drew his own conclusions from Priestley's bungling repetition of Cavendish's experiments. It was, moreover, published to the world and suffered to remain uncontradicted while all the parties were alive and in frequent intercourse with the author and with each other.

Mr. Bennett has felt it to be his duty as executor to the late Mr. Brown to communicate the foregoing particulars to the President of the Royal Society, by whom they have been laid before the Society.

It is a remarkable fact that notwithstanding all the researches made on many occasions during the past half century on the claim to the Discovery of the Composition of Water, and even within the past year by eminent *savans*, the evidence published by De Luc, in 1787, remained undiscovered, with an exception, that being as above mentioned, the late Robert Brown, Esq., and this is the more remarkable when we remember that De Luc's chapter, already referred to, is especially devoted to anecdotes on the subject in question.

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*New Method of Preparing Sulphurous Acid.** By E. F. Anthon.

The author placed

2 ounces of sulphur in fragments, and
25 ounces of concentrated sulphuric acid

into a glass flask, furnished with a gas tube, and heated it over a spirit-lamp. The sulphur soon melted, and in a short time there was an evolution of sulphurous acid which was conducted into water. The evolution was very uniform, and the burning of the spirit-lamp was continued until, after about six hours, there was only a comparatively small residue in the flask.

During this treatment the sulphur constantly floated in the form of a transparent hyacinth-red, thickly fluid mass on the hot sulphuric acid, and a small portion of it sublimed; part of this condensed again in drops upon the walls of the flask, and flowed back into the acid, whilst another part was deposited in the form of a thin crust in the neck of

* From the London Chemical Gazette, No. 105.

the flask. Very small quantities of sulphur were carried further mechanically by the sulphurous acid, and deposited in the conducting tube, and the water placed to absorb the gas.

After the conclusion of the process the flask contained only

4½ drachms of sulphuric acid, and
32 grains of unaltered sulphur.

The advantages of this process are:—

1. That it furnishes a pure product;
2. That it is easily effected, and cheap;
3. That the evolution of sulphurous acid gas is very uniform, the reason of which is that the sulphuric acid always acts only upon the outer surface of the melted sulphur, and this always forms a coherent mass; and
4. That no solid deposit settles to the bottom of the vessel of evolution, which, in other methods, so often occasions the cracking of the vessel.—Dingler's *Polyt. Journal*, cl. p. 379; and *Chem. Centralblatt*, Feb. 2, 1859, p. 78.

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*Rapidity of Thought or Nervous Action.** By M. Ule, Revue Suisse.

The method of transforming the valuation of time into space by the rapid revolution of a cylinder, proposed by Mr. Fizeau, has been applied to the measurement of the rapidity of nervous impulse. Such a cylinder rotating 1000 times a second, and divided into 360 degrees, may measure 1-360,000th part of a second; or rotating 1500 times a second, 1-540,000th part of a second; and even this may be subdivided by a microscope, so as to obtain the 10-millioneth, or perhaps 100-millioneth part of a second. By this extreme minuteness of subdivision of time, it is not difficult to measure even the rapidity of a nervous impulse. If an electric shock be given to the arm, it produces a sensation and a contraction of the muscles. Hence, by noting the interval of time between the shock and the contraction, the time occupied by the transmission of the sensation and the action of the brain, however quick, will be determined. By trying the experiment with different parts of the body, sensible differences have been observed, the shock applied to the thumb being one-thirtieth of a second behind that applied to the face; and this difference pertains to the transmission and not to the action of the brain, and hence enables us to eliminate the latter in the experiments. In this way it has been found by M. Helmholtz, by whom these experiments have been made with the most care:—1. That sensations are transmitted to the brain at a rapidity of about 180 *feet per second*, or at one-fifth the rate of sound; and this is nearly the same in all individuals. 2. The brain requires *one-tenth of a second* to transmit its orders to the nerves which preside over voluntary motion; but this amount varies much in different individuals, and in the same individual at different times, according to the disposition or the condition at the time, and is more regular the more

* From the Edin. New Philosophical Journal, Oct., 1858.

sustained the attention. 3. The time required to transmit an order to the muscles by the motor nerves is nearly the same as that required by the nerves of sensation to pass a sensation; moreover, it passes nearly one-hundredth of a second before the muscles are put in motion. 4. The whole operation requires one-and-a-quarter to two-tenths of a second. Consequently, when we speak of an active, ardent mind, or of one that is slow, cold, or apathetic, it is not a mere figure of rhetoric.

Uniform Diapason.

A committee was appointed by the French Government in 1858 to examine into the expediency of establishing throughout France a uniform pitch or tone for the regulation of musical instruments. On the report of this committee made by M. Halevy, the composer, a decree has been issued by which a uniform diapason has been created for all the musical establishments in France, Imperial and other theatres in Paris, and in the departments, conservatories, succursal schools, and public concerts authorized by the Government. The *la* (a') corresponds to 870 vibrations per second. It is to be called the Normal Diapason.—*Cosmos.*

The diapason adopted by the *Congres Scientifique* held at Stuttgard in 1834, was *la* $(a') = 880$. This movement is therefore towards lowering the concert pitch. Savart gave as the diapason of the opera at Paris in 1834, $la = 886\tfrac{8}{15}$. Another diapason given by M. Scheibler as that of the Academy of Music at Paris in the same year was 867·5. The starting point will now be $c = 1{\cdot}01953125$. And the gamut will be as follows:—*ut* $(c') = 522$. *re* $(d') = 587{\cdot}25$. *mi* $(e') = 652{\cdot}5$. *fa* $(f') = 696$. *sol* $(g') = 783$. *la* $(a') = 870$. *si* $(b') = 978{\cdot}75$. *ut* $(c'') = 1044$.

*Use of Words.**

A score of years ago there was talk about *endosmose* and *exosmose*, the gradual escape of gases through the barrier which ought to have kept them apart, and mixture with each other. These things exist in language: scientific words creep into common life, and *vice versa*:—*vice versa* itself is an instance. We know from Walter Scott and others that the sonorous word *meridian* came into Scotland to signify a dram taken at noon. We have recently found in an eminent man of the seventeenth century, no less a person than Huyghens, a proof of the universality of twelve o'clock as the dinner-hour in the seventeenth century. Speaking of the well-known method of double altitudes, he describes it as done by equal altitudes of the sun before and after *dinner*, a sound which he must have held to mean noon as to time, whatever it meant as to substance. It is much to be regretted that men of science never allow the long words to be corrupted down into something easier; what

* From the Lond. Athenæum, Feb., 1859.

a pity that they cannot hand them over to the vulgar to have the corners knocked off, since they will not take their terms out of our own language. To this day they cannot speak of the two parts of a fraction under nine syllables, *numerator* and *denominator*, which are always coming together, and make as much rattle as a cab driving up to the door. By a rough computation, we find that the amount of superfluous muscular contraction employed in speaking of fractions by all the mathematicians of Europe since the invention of printing, would, collected into one effort, have set the *Great Eastern* afloat, and carried her nearly three miles beyond the Nore! Why not cut these rattling polysyllables down into *numer* and *denomer*, pleasant and easy sounds? So much to the arithmeticians on one point: as Whiston said to Queen Caroline, when they have mended this fault, we will tell them of another.—*London Athenæum, Feb.*, 1859.

A New Silk-Worm.

M. Guerin-Meneville, announces to the Academy of Sciences, that he has succeeded in naturalizing in France a new variety of the silk-worm from China, which lives upon the leaves of the Ailanthus. He speaks of the silk as equal in quality and superior in quantity of that from the worm of the castor-oil plant, or even of the mulberry.

Might it not be worth while to some of our more enterprising farmers to endeavor again to introduce among us this most important branch of manufacture, which appears to have failed before, chiefly from becoming the object of a wild speculation? The ailanthus grows freely in this climate, and is much sought after in our cities as a hardy shade tree.

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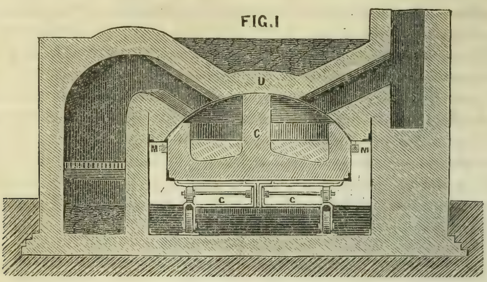
*Improved Furnaces for Manufacturing Iron.** By Jos. Maudslay.

Every engineer knows that immense expense is incurred in the manufacture of those large masses of wrought iron which have to be used for certain parts of steam engines for which ordinary cast iron cannot, with security, be employed. After many years' experience, especially in connexion with the manufacture of large marine engines for the Admiralty, Mr. Joseph Maudslay, of Lambeth, has instituted experiments with the view of producing an iron which should possess but little less strength than wrought iron, and at the same time be susceptible of being cast in moulds to the forms required; and he has been, to a very great extent, successful. The apparatus by which he effects his object is a rotating furnace moving about an inclined axis, as illustrated in figs. 1 and 2 of the annexed engravings, of which fig. 1 is a longitudinal vertical section, and fig. 2 a transverse vertical section through the bed of the furnace. C is the inclined bed of the furnace, which is made to revolve about an inclined axis; D, an arched cover above the furnace, which cover is supported by a fixed iron frame, or casing; E, the door through which the furnace is charged with metal; F, a tapping-hole through which the me-

* From the Lond. Mechanics' Mag., Jan., 1859.

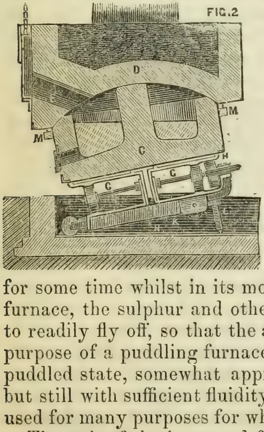
tal is run off; G, a roller frame, upon which the bed of the furnace revolves; H, a bevel pinion gearing into the teeth of the wheel for giving motion to the revolving bed; K, a lower frame furnished with wheels,

FIG. 1



by means of which the revolving bed, after being lowered by the screw L, may be withdrawn from beneath the arched cover for repairs or otherwise. The wheels of the lower frame run upon rails, R; M is a sand-joint for preventing the access of cold air into the furnace between the fixed top and the revolving bed; N is the flue leading to the chimney. The arrangement of the furnace above described is the best with which the inventor is at present acquainted for carrying his invention into effect, but he does not limit himself to the details thereof, as they may be variously modified.

FIG. 2



By keeping the metal stirred about for some time whilst in its molten condition, by means of the rotating furnace, the sulphur and other impurities contained in it are allowed to readily fly off, so that the apparatus answers, in some measure, the purpose of a puddling furnace, and leaves the metal itself in a semi-puddled state, somewhat approaching the condition of wrought iron, but still with sufficient fluidity to allow of its being run into moulds and used for many purposes for which wrought iron is at present employed.

The axis of the improved furnace is placed by preference about 10° out of the perpendicular.

On the Melting and Solidification of Water.

M. Mousson reports in the *Bibliotheque Universelle de Genève*, an interesting set of experiments made by him for the purpose of determining the effect of pressure on the melting point of ice.

He first exposed a number of capillary tubes of diameters varying from 0·0074 inch to 0·1 inch, and containing columns of water about 12 inches long, to the air. The exposure lasted seven days, during which

the temperature never rose above 28·5° Fah., and went down every night below 23° Fah. Upon withdrawing the tubes, all those whose diameter was greater than 0·36 inch had frozen; and all those whose diameter was less than 0·275 inch had remained liquid, nor did a sudden blow cause them to freeze. By arranging the tubes in an inclined position so as to plunge them in a vessel of water, it was found that the formation of the ice externally, favored their freezing. The two tubes of least diameter (0·013 and 0·0074 inch) alone remained liquid.

The sheet of water between two plates of glass pressed together by screws, will not freeze; but if they be simply laid on each other, the sheet which is then thicker, will freeze.

Blocks of ice from 3 to 4·5 inches cube were placed in a hydraulic press and reduced to sheets of a few hundredths of an inch in thickness. Although the temperature of the air was only a few degrees above the freezing point, the water trickled from the blocks on all sides.

In order to prevent the expansion of the water during freezing, a quantity was introduced into a cylindrical cavity of about 0·24 inch in diameter, in a heavy prism of wrought iron. The water in the cavity was compressed by a powerful screw, and then exposed to cold. The water remained liquid at 26·6° Fah. In an attempt to reduce the temperature to 23° Fah., the apparatus began to leak.

A quantity of water was then introduced into a cavity in a similar prism of steel, and after being frozen, the ice was compressed by means of a powerful screw moving a copper cone. The apparatus was surrounded by a freezing mixture, the temperature of which varied from —0·4° to —6·7° Fah.; the temperature of the air was below 32°, and the movement of the screw was performed so slowly as to make but two turns, (or forward motion) of 0·36 inch in four hours. The ice was liquified by the pressure, as was indicated by the position of a small wire index which had been frozen into the mass.

The pressure to which it had been exposed was 13,070 atmospheres, by which the freezing point was reduced below 0° Fah.

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*Can a suitable Insulating Material be found Possessing a Lower Specific Inductive Capacity than Gutta-percha?** By E. O. WILDMAN WHITEHOUSE, Esq.

The amount of induction and consequent retardation in submarine wires—other conditions being alike—would seem to depend so greatly upon this property of the insulating sheath, that it would be most desirable that some experiments should be made with the object of determining this point.

A substance, or rather solution or compound, suggested by Mr. Statham, and recently perfected and adopted at the gutta-percha works —with which the wire is coated, before it receives the gutta-percha— will be found, if I mistake not, to be a step in this direction, while at the same time it enhances largely the perfection of the insulation.

It still might be an object of legitimate research to discover some

* From the London Mechanics' Magazine, October, 1858.

substance of very low specific inductive capacity, which shall possess all the mechanical and chemical properties requisite for this purpose. —*British Association*, 1858.

Curious Phenomena in Yellow Glass.

Mr. Ponting, in a letter to the London Photographic Society, states that he has used in the windows of his laboratory, panes of glass colored yellow by oxide of silver for five years without perceiving any change in their optical properties, until a week before the date of his letter, when he found that they had suddenly ceased to intercept the chemical rays. By careful comparison with others, he could not find that their color had perceptibly changed. *Cosmos, Oct.* 1, 1858.

*Application of Photography to Wood Engraving.** By R. Hunt.

Numerous experiments have, from time to time, been made to produce photographic pictures upon box-wood blocks, of such a character that the wood engraver would be enabled to work upon them. Hitherto success has not attended these efforts; but from some examples which we have lately seen, there is every reason for supposing that the desired end will shortly be accomplished.

It should be understood that there is not the slightest difficulty in producing very perfect photographic pictures upon box-wood blocks. Even by applying the nitrate or the chloride of silver to the surface of the wood, very satisfactory photographs could be obtained; but the difficulty in this case is that the silver salt gives a brittleness to the wood, and it is liable to "chip off" under the tool; hence it is not possible to produce fine lines.

By coating the wood with albumen this has been avoided, but the wood engraver complains of the presence of the film of albumen preventing him from working with his usual facility. This objection is, however, almost entirely overcome by the use of collodion, the attenuated film offering scarcely any obstruction to the engraver's tool. All that is necessary is, to adopt one of the so-called dry collodion processes, and to obtain from a good negative on glass a positive copy on the block. It is important that the processes should be simplified as much as possible, to avoid all risk of injuring the wood. It is well to coat every part of the wood, except the face, with a thin layer of a transparent varnish, so that the iodized collodion may be applied, and the *face* dipped into the solution of nitrate of silver, without the risk of having any absorption. Again, in the slight fixing process which is necessary, no very high degree of permanence being required, this varnish also protects the wood. By employing a somewhat sluggish collodion process, very charming pictures may be easily obtained and rendered sufficiently permanent.

Now arises the wood engraver's difficulties. He has been trained to cut along certain well-defined lines, and he does not understand working upon a drawing in which there are none of those lines. It is, however, merely a question of education; the conventional system must

* From the London Art Journal, January, 1859.

be abandoned; and the engraver must be taught to use some judgment in the execution of his work. It has been proposed that practised draughtsmen should be employed to indicate, by lines on the photograph, where the wood should be cut. This would be still preserving the same mechanical system which at present exists. Something beyond this is required, and a class of engravers must be educated to work directly from the photograph, without any adventitious aid. We have before us a representation of an amphora, photographed on wood, and engraved by Mr. G. R. De Wilde, of Clerkenwell, which is, in itself, an admirable example of what may be done. This wood-cut shows that no real difficulty exists in the production of photographic pictures upon box-wood blocks, which may be cut, and from which very beautiful impressions may be obtained.

The advantages of such an application are manifold. The truthfulness, in the first place, is one of its greatest recommendations; and for objects which have any relation to science, this is paramount to every other consideration. The rapidity of production is another advantage, since it would enable authors and publishers to be far more liberal in their illustrations than they can afford to be at present.

At this time we have wood engraving advanced to a high degree of excellence, and we very justly admire the results; but if we could at once transfer to the wood the copy of a negative on glass, which represented some scene of sacred or historic interest, how much more satisfactory would it be to all. We know that the wood engraver is supplied with photographs of machinery and other objects, which he copies with great labor, by the pencil, on the wood. The same photograph on the wood should be at once available; and instead of the pencil, the wood-cutter should be instructed to use the graver. The perfection of such reproductions, as it regards the relative dimensions, distances, &c., and the correctness of all the details, would be unfailing recommendations. We learn that the wood engravers of Germany are now availing themselves of photography to a considerable extent; and we hope we shall not be long before we have to refer to English examples of this most useful application of a very beautiful art.

Saponification of Fats by Chloride of Zinc. By LEON KRAFFT and TESSIE DU MOTTAY.

"When any neutral fatty matter is heated with anhydrous chloride of zinc, we see it melt and disappear gradually as the temperature rises. Between 300° and 400° (Fahr.,) the mixture of the two bodies is complete. If the temperature be maintained for some time, and the mixture be then several times washed with warm water, or better, with water acidulated with hydrochloric acid, we obtain a fat which, when submitted to distillation, gives the fat acids which correspond to it, and with an insignificant production of acroleine. The wash-waters carry off almost the whole of the chloride employed, so that by evaporation this may be again used for another process. The fat acids are thus produced in as great quantities as by the common methods, and

have the same appearance, the same qualities, and the same fusing-point as those which are obtained after saponification by sulphuric acid. To operate well and quickly, the mixture should be heated rapidly until by the reaction of the two bodies on each other, which is of considerable violence, the vapor of water is abundantly evolved."

"In fact, the washing with acidulated water may be dispensed with; but the products then obtained by distillation are softer. If, however, the distillation be carried on by means of a current of superheated steam, this defect may be in a great measure cured. In all our experiments, the use of superheated steam produced the products more rapidly, more firm, and less colored."

The experiments were instituted with a view to allow the inhabitants of South America, to convert their fats into stearic acid, without the danger and expense of transporting sulphuric acid to those countries. In an economical point of view this problem is resolved, since the chloride of zinc is sold at Marseilles never higher than 2¼ cts. per pound, and packed in cases or barrels can be shipped without danger or inconvenience.—*Comptes Rendus de l'Academie des Sciences*, (*Paris*).

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, April 21, 1859.

John Agnew, Vice President, in the chair.

John F. Frazer, Treasurer, present.

Washington Jones, Recording Secretary, P. T.

The minutes of the last meeting were read and approved.

A letter was read from the Royal Society of London.

Donations to the Library were received from the Institute of Actuaries, and the Chemical Society of London; La Société Industrielle du Mulhouse, France; the Lower Austrian Mechanics' Association, Vienna, Austria; the Smithsonian Institution, Washington City, D. C.; the Mercantile Library Association, St. Louis, Missouri; H. Bailliere, Esq., City of New York; the Mercantile Library Association, Brooklyn, New York; the Long Island Railroad Co., New York; the Ohio Mechanics' Association, Cincinnati, Ohio; the State of Pennsylvania; Dr. T. B. Wilson, Prof. John F. Frazer, T. S. Stewart, Esq., Prof. F. Rogers, Prof. B. H. Rand, Prof. J. A. Meigs, and George M. Conarroe, Esq., Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement for March.

The Board of Managers and Standing Committees reported their minutes.

The Board of Managers reported that Uriah A. Boyden, Esq., of Boston, Mass., has deposited with the Institute $1000, which he requests the Institute to award to "such person as shall, by researching in North America, prove to the satisfaction of the Institute, whether

all the rays which may be known, have or have not equal velocities of transmission."

The Board of Managers have, on the recommendation of the Managers of the Sinking Fund and Finance, accepted the Trust, and have appointed a special Committee consisting of Professors John C. Cresson, John F. Frazer, and Alex. Dallas Bache, to define the terms of the premium; and the Board now report their action in the case, and ask the sanction of the Institute.

On motion of Mr. C. B. Rogers, it was

Resolved—That the Franklin Institute sanction the action of the Board of Managers in the subject of the prize proposed by Mr. U. A. Boyden.

The Actuary reported that the following Standing Committees have organized by electing their Chairman, and appointing their times of meeting:—

Committees.	*Chairman.*	*Meetings.*
On Models,	Wm. B. Bement,	2d Monday evening.
" Meteorology,	Prof. J. A. Kirkpatrick,	3d Friday "

Candidates for membership in the Institute (5) were proposed, and those proposed at the last meeting (3) were duly elected.

Mr. J. E. Wootten presented his patented design for gauge-cocks intended to indicate the exact height of the water in steam boilers. It resembles somewhat that invented by Mr. Tyler, but has some additions and improvements. A full description with a cut will be given in the *Journal of the Franklin Institute* for June.

BIBLIOGRAPHICAL NOTICE.

Journal of the American Geographical and Statistical Society. 4to. monthly, pp. 32. Published for the Society by John H. Schuttz & Co., 9, Spruce St., New York.

The American Geographical and Statistical Society of New York, is one of our most flourishing, as it is one of our most deserving scientific bodies. We have always read with great interest the imperfect report of their proceedings as published in the daily papers, and have preserved, as of great value, many of the communications which have been made to them on the subject of geography, especially that of our own continent.

We are glad to find that they have determined to publish a Journal in which these valuable materials will be hereafter preserved in an accessible form. The two numbers of this new publication which are now before us, have a great number of very interesting articles on a variety of subjects, kindred to the purposes of the society, illustrated by maps and tables; and the manner in which they are presented to the world is creditable to the Society and to the publishers.

We strongly recommend this Journal to the notice of those of our subscribers who are interested in geography and statistics.

Ed. F. I. J.

Abstract of Meteorological Observations for February, 1859; made in Philadelphia, Somerset, and Dauphin Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.

1859. Feb.	Barometer. Mean.	Barometer. Mean daily range.	Thermometer. Mean.	Thermometer. Daily oscillation.	Thermometer. Mean daily range.	Relative humidity. 2 P. M.	Force of vapor. 2 P.M.	Rain and Snow.	Prevail'g winds.
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	Direc.
1	30·059	·152	36·2	19	4·5	45	·129		(var.)
●2	29·750	·310	38·5	12	2·3	68	·195	0·640	N E.
3	29·502	·248	34·0	5	5·5	95	·186	0·045	N N E.
4	29·663	·162	35·3	10	3·3	55	·130	0·010	S W.
5	30·119	·456	30·3	11	5·0	60	·113		N W.
6	29·972	·166	33·2	7	2·7	95	·189	0·732	N E.
7	30·113	·163	29·3	8	3·8	69	·125		N W.
8	30·047	·151	31·5	18	6·2	80	·162		N N E.
9	29·508	·539	38·3	9	6·8	86	·214	0·210	(var.)
☽10	29·821	·371	28·0	10	10·3	67	·112		N W.
11	30·209	·387	22·8	7	5·2	61	·078	0·008	S.
12	30·004	·205	28·3	12	5·5	78	·130		N E.
13	30·053	·049	28·7	9	1·0	74	·135		(var.)
14	30·041	·009	34·3	17	5·7	34	·081		W N W
15	29·821	·221	39·0	10	4·7	82	·212	0·135	(var.)
16	29·826	·144	44·0	14	5·0	78	·283	0·166	(var.)
○17	30·148	·322	40·7	13	3·3	62	·191		(var.)
18	29·877	·271	42·3	8	2·3	84	·252	0·555	N N E.
19	29·949	·159	38·7	10	3·7	82	·203	0·350	(var.)
20	29·527	·423	49·7	15	11·0	93	·404	0·020	(var.)
21	29·784	·257	36·3	9	13·3	31	·077		W N W
22	29·983	·166	41·7	23	8·0	35	·135		S W.
23	29·842	·141	49·0	29	7·3	36	·201		S W.
☾24	29·776	·207	42·7	21	12·3	44	·152		N W.
25	29·996	·225	28·0	8	14·7	76	·112	0·250	N E.
26	29·755	·238	35·7	15	7·7	81	·194	0·448	N E.
27	29·834	·145	40·8	27	8·5	33	·129		S W.
28	29·803	·175	42·7	13	6·2	37	·129		W N W
Means	29·885	·230	36·4	13	6·3	65	·166	3·569	N 43° W

SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.

1859. Feb.	Barometer. Mean.	Barometer. Mean daily range.	Ther. Mean.	Ther. Mean daily range.	Relative humidity. 2 P. M.	Force of vapor. 2 P.M.	Rain and Snow.	Prevail'g winds
	Inch.	Inch.	°	°	Per ct.	Inch.	Inch.	Direc.
1	27·732	·152	33·7	6·3	61	·191		W.
●2	27·337	·385	34·7	7·0	55	·130		S E.
3	27·194	·197	30·7	4·7	100	·181	0·215	W.
4	27·364	·128	23·3	8·0	89	·168	0·070	W.
5	27·695	·384	26·7	6·0	55	·130		(var.)
6	27·691	·013	27·3	8·0	89	161		(var.)
7	27·739	·061	26·7	6·7	44	·111		(var.)
8	27·617	·113	30·0	5·3	81	·186		S S E.
9	27·271	·342	35·0	5·7	100	·257	0·426	(var.)
☽10	27·616	·288	18·7	16·3	100	·135		N N W.
11	27·754	·189	18·3	3·7	100	·118	0·047	S E.
12	27·662	·113	28·7	10·3	95	·168	0·039	W.
13	27·742	·095	20·7	8·0	100	·135	0·053	W.
14	27·706	·026	29·7	11·3	63	144		S W.
15	27·471	·243	40·3	11·0	100	·257	0·801	W S W.
16	27·604	·133	38·7	5·7	87	·238		N W.
○17	27·696	·170	35·7	4·3	69	·176	0·657	S S E.
18	27·603	·145	42·7	7·0	66	·288		(var.)
19	27·558	·074	44·0	8·7	100	·299	0·980	S.
20	27·298	·337	44·3	11·7	68	·204		W.
21	27·633	·344	27·3	17·0	88	·153		W.
22	27·697	·109	36·0	8·7	66	·208		S W.
23	27·601	·104	48·3	12·3	59	·295	0·153	(var.)
☾24	27·607	·052	38·3	10·0	64	·160		N W.
25	27·499	·092	24·3	14·0	100	·141	0·643	S E.
26	27·467	·064	35·3	11·0	60	·153	0·303	W.
27	27·475	·086	40·3	9·7	49	·205		S.
28	27·631	·129	32·3	13·3	63	·116		W.
Means	27·570	·163	32·5	9·0	77	·182	4·387	

HARRISBURG, Dauphin Co. Lat. 40° 16′, N. Long. 76° 15′, W. JOHN HEISELY, M. D., Observer.

1859. Feb.	Barometer. Mean.	Barometer. Mean daily range.	Ther. Mean	Ther. Mean daily range.	Prevail'g winds
	Inch.	Inch.	°	°	Direc.
1	29·965	·160	35·7	5·0	N.
●2	29 .90	·375	36·7	1·7	E.
3	29·348	·188	34·7	2·7	E.
4					S.
5	30·019		28·3		N W.
6	29·900	·138	33·0	4·7	S E.
7	30·015	·121	31·3	1·7	N W.
8	29·947	·090	31·3	2·0	S E.
9	29·414	·533	38·3	7·0	S E.
☽10	29·750	·361	28·7	9·7	N W.
11	30·093	·342	26·0	2·7	E.
12	29·909	·183	29·0	3·0	S E.
13	29·986	·077	29·7	2·0	W.
14	29·934	·053	34·7	5·0	N W.
15	29·689	·245	38·3	3·7	E.
16	29·721	·170	42·7	4·3	W.
○17	30·009	·289	38·3	4·3	E.
18	29·782	·361	40·7	2·3	E.
19	29·812	·154	39·0	1·7	S E.
20	29·326	·486	45·7	6·7	N W.
21	29·731	·405	35·0	10·7	N W.
22	29·862	·164	41·7	6·7	W.
23	29·699	·163	46·3	4·7	W.
☾24	29·709	·174	44·3	9·3	N W.
25	29·865	·194	27·7	16·7	S E.
26	29·678	·187	32·0	7·7	S E.
27	29·704	·120	38·7	6·7	S E.
28	29·712	·195	41·7	6·3	N W.
Means	29·784	·228	34·3	5·3	

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

JUNE, 1859.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Steam and its Condensation. By THOMAS PROSSER, C. E.

(Continued from page 294.)

CHAPTER VII.

On the Steam Jacket of Gordon McKay, Esq.

What is the precise nature of the information furnished by Gordon McKay, Esq., (*p.* 232, *anti*,) in relation to the economy of the steam jacket? I confess myself totally unable to comprehend it, except on the assumption, that the fuel consumed was in exact proportion to the water which left the boiler. I trust the presumption is a fair one, in the absence of any allusion whatever to the nature or quantity of the fuel consumed, which is in reality the only consideration worth notice, and which, therefore, I presume, was inadvertently omitted.

Still, I am not out of my difficulties in this matter; for I cannot comprehend how, in the first experiment, nearly one-third of "the water evaporated from the boiler" was "used in leaks of joints, boiler, &c." (There should be no *&c.*, in experiments of this kind,) 500·7 lbs. of water leaves the boiler, of which 164 lbs. is not accounted for as steam. Surely, then, it must have condensed in the cylinder, or gone over as water in a vesicular state, notwithstanding the steam jacket and four inches of cotton over that, for I cannot suppose Mr. McKay really means to be understood as using such a leaky concern, as his language implies. Therefore, putting the best construction upon it, it affords but little encouragement for steam jackets.

It appears that 15·7 lbs. of steam was condensed in the jacket and returned to the boiler as water at 328° F. to be re-evaporated, for it was just as much new water as if it had been taken from the reservoir, and is therefore very properly added to the weight of water evaporated, but note, its temperature was much higher. How much, we are not informed; but if we assume the reservoir water to have been at 60° F., we have 268° = (328—60). Now the latent heat of steam at 328° F. is about 856°, and if we multiply that by 15·7 lbs., we get 13439° of latent heat, which has gone into the cylinder to keep it warm—that is the cost of it. Well, we have against that, in the second experiment, 145 = (630—485) lbs. of water more than in the first experiment, which left the boiler and passed through the cylinder. Now as McKay acknowledges that the condensation is in proportion to the condensing surfaces, (and of course multiplied by the difference of temperature, which I have more than once shown in this *Journal*,) it follows that no more steam can by any possibility be condensed, for the cylinder attains the same normal state of temperature in both cases; and therefore the 145 lbs. of water additional must have gone over in a vesicular state, entering the cylinder at 328° F. and leaving it at 220°. Thus the cylinder has absorbed 108° = (328—220), which being multiplied by 145 lbs. gives 15660° of heat required to keep the cylinder warm, with vesicular water entering it on the inside and parting with its sensible heat, against 13439° of heat required on the outside thereof and within the jacket, with steam parting with its latent heat. But, 15·7 lbs. of the water in the first experiment, had a temperature of 268° higher than the same quantity of water in the second one; and if we multiply 15·7 lbs. by 268°, we have 4207·6° to be deducted from 15660°, leaving but 11452·4° of heat, or 1986·6° less to keep the cylinder warm without the steam jacket than was required with it. I am assuming here, that 26·3 lbs. of the vesicular water, after it had left the cylinder at 220° F., was available for re-evaporation in the boiler, as a set-off against the 15·7 at 328° in the first experiment, for 26·3 × (220—60) = 15·7 × (328—60). Doubtless more than this 26·3 lbs. of the 145 lbs. was available to economize the fuel, and therefore at whatever lower temperature the hot water assumed, the quantity of heat was available just the same, by increasing the quantity of hot water from an ample store.

I am really very sorry for steam jackets, for it certainly does look like being worth about 15 per cent. less than nothing.

This I think cannot be—but it is a legitimate conclusion, and the only one as it appears to me which can well be arrived at from the data given, and does support the view taken by "engineers of high standing, who deny the efficacy of the steam jacket," and consider it "a positive injury." Tredgold supports this view of the case and one of his editors the opposite.

I will mention here a fact which I have observed, that, in a boiler which ordinarily delivers its steam at more than 20° F. (and sometimes 47°) hotter than the water that it is produced from (caused by the tube heating surface passing through the steam), the temperature has been

41° F. below it. One thermometer was in the steam and another in the water; both were plunged into baths of mercury, surrounded with a jacket in fact, and well clothed with felt and canvass. The work light, the fire down, and damper open, the rush of cold air will at any time have a similar effect, although not often to such an extent as above noticed.

Now where there is no steam jacket, there is a greater draft on the boiler from the cylinder to keep up its normal temperature. If the steam is sufficiently surcharged, there is then no condensation in the cylinder (but there is a cutting up of the valve faces). If there is just the same amount of condensation as there is with a steam jacket, then the superheat supplies the place of the steam in the jacket. But, if the boiler cannot supply this *heat* in the shape of steam in a superheated state, it will supply it in the shape of vesicular water, that being the cheapest form in which it can do it, the temperature of the steam falls below that of the water from which it is produced, radiation is reduced, and the greater specific heat of water over steam is brought into economical operation; for, as I take it, a change of state cannot be produced at *no* cost.

I confess to having entertained different sentiments in relation to my old friend the steam jacket, and that I am now groping about in the dark, as it appears to me that Mr. McKay also is; at the same time I am much obliged to him, as everybody should be, for spending his money and his time in endeavoring to unravel the mysteries of this very difficult subject. As Mr. McKay has a boiler and engine constructed expressly for the purpose, may I suggest to him a repetition of the second experiment with a little alteration, viz: to place the reservoir sufficiently low to allow of the return of the vesicular water, and as much of the condensed steam as condenses spontaneous in the atmosphere, into a small vessel, at the top, and communicating with his reservoir at the bottom of both by means of a pipe, and taking his feed-water from the top of the small vessel, so as to pump all the hot water which offers into the boiler first.

By this means, and noting accurately the weight of fuel burned, I anticipate a saving in fuel will be observed.

By my "method of applying the power of steam and condensing the same," as described in this *Journal*,* I can, at will, produce this vesicular water, otherwise called priming, together with the water of condensation in the cylinder, and exhibit them in a manner which no other system admits of; and hence, even as a mere study of the physiology of the steam engine, it is highly interesting, and as a practical test of the fireman's skill and fidelity, entirely reliable. When the vesicular water is going over, the steam gauge does not necessarily fall, nor the water in the boiler lose in temperature; nay, even quite the contrary may happen and often does, but the temperature of the steam is invariably found to be below that of the water, a fact which I believe has never before been recorded if observed.

* Engineers affect to make a distinction between vesicular water and priming; in the latter case, they say, the water goes over in a body; but, where is the line of demarcation? What the difference?

When this vesicular water comes over in my system, and mixes with the condensed steam from the cylinder, it all goes to waste together, for nothing but pure steam enters the condenser; its temperature is ordinarily about 230° F., while that of the feed water may be, say, 200° F., in which case the 30° F. of difference is an entire loss, and hence it should be prevented and the steam worked moderately dry, but not so dry as to cause cutting of the valve faces, which will always occur when there is no condensation in the cylinder to lubricate them, in the absence of grease—a thing of very questionable utility in working with wet steam—which term properly applies, as I believe, to all steam made in the ordinary way, and I have no doubt that such steam is generally of a lower temperature than the water it is produced from.

To this cause, independent of steam space in the boiler, I attribute priming; for if a boiler makes the steam and *surcharges* it, just as fast as the engine takes it, there will be no priming, however small the steam space may be. But if the engine makes a suddenly increased demand upon the boiler, or if too much air is admitted over the fire, or the damper is too wide open, any of these may cause a fall in the temperature of the steam without a corresponding one in that of the water; and whenever the steam is at a lower temperature than the water, and not before, priming will commence, for the reason, as I have before stated, that hot water is cheaper than steam—the demand being not for more working steam only, but for more heat to keep the cylinder at the normal temperature, that is to say, at the same temperature as a steam jacket would keep it, due to that of the working steam whatever it may be; for the condensation of the working steam is not a per centage of that which enters the cylinder; therefore, the speed of the piston has nothing to do with it; it is a fixed quantity, and is the product of the surface to which it is exposed, and the difference of temperature between those factors. Expanding the steam modifies the action, not the principle, by causing water of condensation in the cylinder to re-boil on the removal of the pressure and thus resume its latent heat, thereby showing a higher degree of tension than is due to the expansion.

We may next consider the question of a steam jacket for low pressure, or rather I suppose we must say, for an air-pump condensing engine.

Now, with a steam jacket the steam leaves its latent heat in the cylinder, and returns the water at the same temperature as the steam in the boiler, and that water is re-evaporated as in Mr. McKay's first experiment. And without a steam jacket, as much vesicular water has to go over into the cylinder as will compensate, by its sensible heat, for the absence of the latent heat of the steam in the jacket. We need not go far to determine this question, for if Mr. McKay's second experiment has been rightly disposed of, as showing there is no advantage in the steam jacket when the effluent vesicular water and condensed steam from the cylinder are available as feed-water at a high temperature, we have only to ascertain the effect of reducing the temperature of that water 100° F. lower in consequence of the intro-

duction of the air-pump condenser. The product of $15 \cdot 7 \times 100°$ is 1570°, which is only about one-tenth of the heat required to keep the cylinder warm according to the experiments; and therefore, if a gain in fact, it is one not worth incurring the expense of a steam jacket to obtain. More particularly is this the case with the method which I have adopted of surcharging the steam (making that, too, a part of the economic supervision through the medium of two thermometers), for the same effect is produced and in a much better manner. By surcharging the steam we prevent vesicular water going over into the cylinder (priming), and as far as is desirable the condensation of the working steam therein. This superheat goes into the cylinder and keeps up its normal temperature by which the amount of condensation allowed is governed. And thus the hot water remains in the boiler, which will otherwise have to go over into the cylinder, and from thence into the condenser, where its life is extinguished in a "wishy-washy everlasting flood" of cold water, which has to be pumped back again into the boiler against the pressure of the steam therein.

The steam jacket came into existence, as Mr. McKay observes, in 1769. The air-pump came with it. As in the ethical so in the physical sciences, one false position requires another to back it. The steam jacket would never have been thought of, had not the air-pump been introduced. They have both now attained to a respectable old age, and had better be allowed to die in peace. "Proselytes are ardent partizans," and I am a convert of but a week old to this new doctrine. I have arrived at the conclusion stated, solely by observing the phenomena exhibited by the two thermometers alluded to. The Board of Engineers appointed by the Hon. Isaac Toucey, Secretary of the Navy, to examine into my system, consists of Messrs. Isherwood, King, and Everett; and the former of these gentlemen suggested that a thermometer be placed in the steam space of the boiler to compare with the steam pressure as shown by the gauge, for the purpose of ascertaining the amount (*if any?*) of superheat in the steam. This was done, but nothing could be made out of it. The pressure and temperature appeared to have no sort of connexion with each other, but were perpetually varying. I then placed a thermometer in the water also, and the cause of the erratic movements of the steam was at once discovered, and will, I confidently predict, throw more light upon this difficult subject than it has ever before received. The extreme observed range of variation in the temperature of the steam, above and below that of the water from which it was produced, has been thus far 88° F.; that is to say, the steam has been observed at 41° below, and 47° above the temperature of the water.

The extreme susceptibility of the steam to the action of the fire, at once shows whether the combustion is proceeding properly or not, and two thermometers should therefore be placed upon every boiler to guide the fireman and indicate whether he is skilful, vigilant, and faithful, or not, for there is no possible means by which he can evade the searching scrutiny of those silent monitors.

*The Magnitude of the Public Works of the United States.**

From the New York Times.

It has been fashionable to compare unfavorably the works of this country with those of Europe. To such an extent has this been carried that it is not unfrequently said that we have to look to England or the Continent for most of our examples. We are continually told by travelers of the great extent, beauty, and durability of the continental works, and of the enormous strength of the English structures. Now it is perfectly true that Europe can boast of the railroads, canals, bridges, and aqueducts unrivaled in the world for beauty and excellence of workmanship and design, but it is equally true that America can point to works of utility that, in the magnificence of their proportions, are not exceeded anywhere.

The Julian Aqueduct, of Rome, is two miles longer than the Croton Aqueduct, of New York, built by John B. Jervise and Horatio Allen, but the Croton carries more water than all the seven aqueducts of Rome put together, and more than any other aqueduct in the world, and is longer than any other, excepting the Julian.

The Illinois Central Railroad, built by Col. Mason, is the longest line ever constructed by one company, and in point of workmanship is equal to any European road.

The National Road over the Cumberland mountains, built by the United States Engineer Corps, is more extensive and durable by far than the Appian Way.

The stone arch over Cabin John's Creek, on the Washington Aqueduct, built by Captain Meigs, is about fifty feet greater than any other stone arch in the world, and is more beautiful in proportion than the arch over the Oca, so long celebrated for its magnificence.

The tunnel built by Mr. Haupt, on the summit of the Pennsylvania Railroad, was a more difficult work than the tunnel under the Thames.

The structures on the Baltimore and the Ohio Railroad at Harper's Ferry, and beyond the summit, built by Latrobe, and the Starrocca Viaduct, on the New York and Erie Railroad, built by Julius Adams, are equal in magnificence and excellence of workmanship to anything Brunel ever did in England, or Moran in France.

The Suspension Bridge over the Niagara River, at Lewiston, built by Major Serrell, is 1042 feet 10 inches in one span, and is 43 feet greater than any other single span in the world, being nearly twice as great and quite as strong as Telford's celebrated bridge over the Menai Straits in England.

The United States Dry Dock at Brooklyn is the largest dry dock in the world by many feet. The workmanship, done under the direction of Mr. McAlpine and General Stuart, is equal, if not superior, to anything of the kind anywhere. The plates of iron used in the gates of this dock are the largest that had been made up to the time they were rolled.

The flight of combined locks on the Erie Canal, at Lockport, built by the State Engineers, is equalled only in one other place in Christendom—Sweden.

* From the Salem Register, April 21, 1859.

The Railroad Suspension Bridge, built by Rœbling, over the Niagara, is within a few feet of twice the span of Stephenson's great Tubular Bridge in England, the largest structure of the kind. It is 800 feet in one span, and is two stories high, the railroad being above the public highway. Nothing like this exists anywhere else.

The Light-house on Minot's Ledge, being built by Captain Alexander, is in a more exposed situation, and, as far as proceeded with, is more securely bolted together than the famous Eddystone Light-house in England.

The Bridge at Wheeling, built by Charles Ellet, is exceeded only in span by the Lewiston Bridge, and is heavier than it; it is the second largest span in the world, and is much more beautiful than the Fribourg Bridge, its European rival.

In carpentry we are unexcelled in the world. Such structures in timber as the Dry Docks at San Francisco and Philadelphia, McCullam's and Col. Seymour's bridges on the Erie Railroad and branches, the timber viaducts on the Cattawissa Railroad, built by Stancleff, Col. Long's bridges on the various New England railroads, and How's trusses at Harrisburg, have not their equals across the Atlantic.

Then, again, in Europe many structures are built that might have been avoided—a few hundred rods of detour would have saved the great Box tunnel. Now we maintain that the location of Sidell's division, for example, on the Erie, evinced more skill in avoiding the necessity of great structures than could be shown in building them.

The stones on either corner of the Exchange in Boston, built by Rodgers, are larger than any single stone in Cleopatra's Needle, and those now being put into the United States Treasury, at Washington, are much heavier than any stone of Pompey's Pillar, or the Pyramids of Egypt.

As to the difficulties of location, there is no country where more science and skill have been brought to bear than in ours, and it is a remarkable fact that, in point of time, last year, our average traveling was faster by two and a half miles per hour than in England, comparing our principal lines with theirs, while the charges on the American lines were but little over half the English rates.

The reason why these things are not generally known is, that here we build a great work, announce its completion in the same advertisement that heralds the opening of the road, and no more is said about it, except, perhaps, what may appear in one or two scientific periodicals, where dry feet and inches, stress, strain, and torsion are discussed, and are never read except by the professional engineer.—While on the contrary, in England and France, as soon as a great work is built, and while it is being erected, pictures by thousands are published, medals are struck and circulated, glass models are made, and the illustrated newspapers show it in every stage of progress and from every point of view; the engineer is knighted, if he is not already of the nobility, and the fame of the structure is sent from land to land; while with us, as we have shown, may be found some of the most gigantic works ever undertaken that are passed by and

over without hardly any notice. It is remarkable that the best popular descriptions of our own public works of great magnitude are to be found in the journals of France and Germany. AMERICUS.

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*On the Successful Working, by Locomotive Power, over Gradients of 1 in 17, and Curves of 300 feet radius, on inclines in America.** By Mr. T. S. ISAAC.

[Read before the Institution of Civil Engineers, Nov. 23, 1858.]

(Continued from page 310.)

Discussion.—It was explained that on the Baltimore and Ohio Railway the ordinary goods engines had cylinders of 19 inches diameter, with a stroke of 22 inches: they had eight driving-wheels, of 3 ft. 7 ins. diameter, all coupled. The passenger engines principally employed on the inclines of 1 in 45½, had cylinders of 19 inches diameter and 22 inches stroke, with six driving-wheels, 4 feet 2 inches diameter, all coupled, and a leading truck or "bogie" on four wheels. Peculiar arrangements were made for facilitating the passage over curves of small radius: the centres of the front and hind wheels were only 11 ft. 3 ins. apart, and the intermediate wheels were without any flanches,—the springs being so adjusted as to equalize the weight.

It was stated, that the adhesion of driving-wheels had been shown, from experience in the United States, to be beyond the limits usually assigned. Instances were known where the effective adhesion had been as much as two-fifths of the nominal weight on the driving-wheels; it being assumed that this varied much when running, as compared with the actual weight ascertained by the weighing machine when at rest.

On the Cleveland and Pittsburgh Railway, on the 1st August, 1857, a train of fifty loaded wagons, each on eight wheels, and weighing, with the engine and tender, 800 tons, was drawn up a continuous incline, two miles in length, of 1 in 132. The engine weighed 26·8 tons, with only 19·2 tons on the six coupled wheels. The gravity of the entire train would be 13,575 lbs., whilst the friction, which could not average less than 5 lbs. per ton, would increase the amount to 17,575 lbs., or to more than two-fifths of the weight upon the driving-wheels.

In making a series of trials for the New York and Erie Railway, Mr. Zerah Colburn drove a train of eighty wagons, each on eight wheels, weighing, with the engine and tender, 1270 tons, up a continuous incline of about 1 in 480, with curves of 1145 feet radius. The gravity being 6000 lbs., and the other resistances 8300 lbs., the entire resistance was 14,300 lbs. The weight on the driving-wheels of the engine, at rest, was 40,500 lbs.; hence the adhesion was 0·35 of the insistent weight.

An engine, when on a severe incline, changed its position so much as to alter materially its running condition, which should be provided for in building engines expressly for working inclines.

It was stated that, at the time of construction of the Mountain Top Incline, it was found necessary to place a tank on the eastern slope,

* From the Lond. Mechanics' Mag., Dec., 1858.

on a gradient of 1 in 18·87. During the first two or three summers, the ascending trains were in the habit of stopping daily, and the engines were able to start again without difficulty. There was one engine on the mountain on eight wheels, all coupled; the cylinders were 18 ins. in diameter, with a length of stroke of 22 ins.; the wheels were $3\frac{1}{2}$ feet in diameter, and the gross weight of the engine was 27 tons. This engine had crossed the mountain six times in one day, with a load of 49 tons each time; making the trip in one hour from Turntable to Greenwood, and in one hour and a quarter from Greenwood to Turntable; although it was very rigid and was not adapted to the curves. One of the lighter engines had taken a load from Turntable to Greenwood in half an hour. Mr. Ellet had published a statement of the cost of working, based on the fuel and oil consumed, and the wages of the workmen. Fuel on the mountain cost two dollars per cord. It was difficult to make a just comparison of the various fuels, and to obtain correct information as to the water evaporated. The same cause that prevented the experiments on the resistance of curves, prevented comparative experiments on fuels, and accurate statements of the water evaporated. At first pine was used, but oak had been extensively adopted latterly. The effective pressure of the steam, above that of the atmosphere, usually amounted to from 100 lbs. to 120 lbs.

It was remarked that, whereas, on most English railways, the results of experience showed a resistance of 12 lbs. per ton gross on a level, yet some of the statements which had been made as to the working of railways in the United States, seemed to indicate a resistance of not more than 5 lbs. per ton gross, after allowing for gravitation on the incline; whilst the permanent way of American lines was notoriously inferior in all respects to that of the English lines. The first of the results named in the paper showed a traction resistance of about 150 lbs. per ton gross. In contrast with this, it was stated that, on the Great North of Scotland Railway, near Aberdeen, the Kitty Brewster Incline of 1 in 59, and full of quick curves, had been worked for the last three years by two tank locomotives, having cylinders 15 inches diameter, with a length of stroke of 24 inches, and four wheels coupled, each $4\frac{1}{2}$ feet diameter, at a steam pressure of 150 lbs.; the load on the driving-wheels being 15 tons, on the leading wheels 10 tons, and the gross weight, in working order, 25 tons. The trains were started from the foot of the incline. One of these engines could take up nineteen wagons, weighing, when loaded, about 11 tons each—making a total gross weight of train, behind the engine, of 200 tons—at 10 miles per hour. The greatest load that had been taken was twenty-one wagons, of a gross weight of 230 tons, at five miles per hour. The average ordinary train taken up the incline, consisted of eighteen wagons, each weighing 8 to 11 tons gross; the total weight being, say, 160 tons gross, at 10 miles per hour; but excursion trains of loaded carriages, weighing, when empty, $5\frac{1}{2}$ tons each, and $7\frac{1}{2}$ tons when loaded, making a gross load of, say, 200 tons, had also been taken up. The resistance of the train indicated on the piston, after allowing for gravitation on the incline, amounted to 13 lbs. per ton gross of engine, tender, and

trains, which contrasted favorably with the estimated traction resistance of 150 lbs. per ton gross on the American incline.

With reference to the influence of curves upon resistance, it had been found that, at a speed of 45 miles per hour, the traction resistance was greater, by 20 per cent., on a line having curves under one mile radius, at the rate of one curve in $2\frac{1}{2}$ miles, than on a practically straight line.

It was remarked, that the Whitstable branch of the South Eastern Railway, on which there was a gradient of 1 in 30, had originally been worked by stationary engines and rope traction; but as the traffic was intermittent, it had been determined, some years ago, to substitute locomotive power, and this application had been quite successful. Bury's four-wheel coupled engines, having cylinders 14 inches in diameter, with a length of stroke of 24 inches, the wheels being 4 feet 6 inches in diameter, were still in use on this branch. Four trucks of coal were taken up the incline of 1 in 30,—the gross weight, including the engine and tender, being about 50 tons.

On the Folkestone Branch of the same line, which had an inclination of 1 in 30 for upwards of three-quarters of a mile, four-wheel tank engines, constructed on Mr. Crampton's plan, were employed. The four wheels of $4\frac{1}{2}$ feet diameter were all coupled; the cylinders were 16 inches diameter, with a length of stroke of 24 inches; the weight of the engine was $26\frac{1}{2}$ tons, and the pressure of the steam was 120 lbs. per square inch. These engines had taken up the incline a load of fourteen carriages, equal to a gross weight of 100 tons, including the engine.

It was believed that the peculiar construction of the engines and carriages in the United States, tended to lessen the resistance of curves. It was well known that, in New York, and in other American cities, the railways were brought into the streets,—horse power being then employed,—and that the trains were conducted round the turnings of streets with great facility. As to the cost of construction of American railways, it appeared from official returns, which had been carefully compiled, that in the State of Massachusetts, the cost of the principal lines had amounted to £10,599 per mile, or £9489 per mile, exclusive of rolling stock. In the State of New York these figures were respectively £11,200 and £9762 per mile. It should be stated that a large proportion of the American railways consisted of single way, and that their cost ranged between £5000 and £14,000 per mile.

The Manchester, Sheffield, and Lincolnshire Railway, with a gradient of 1 in 130 for upwards of 22 miles, was mentioned as a case of a main trunk line, upon which there was a large traffic, necessitating the employment of heavy engines. Ordinary inside cylinder engines were employed,—the cylinders being 18 inches in diameter, with a length of stroke of 24 inches; the wheels being 5 feet in diameter, all coupled. They weighed, when in working order, 31 tons, were worked at a pressure of 130 lbs. to the square inch, and would draw a load of forty wagons, weighing 130 tons, independent of the weight of the engine and tender.

The great feature in the paper under discussion was thought to con-

sist in the statement, that two-fifths of the weight of the engine had been obtained as adhesive capability; whereas, in this country, one-fourth had been considered as much as could be relied on, in all states of the rails. On the West Cornwall Railway, loads of about 13 tons had been conveyed up an incline of 1 in 13, for a distance of from a half to three-quarters of a mile. The engine had four wheels coupled, and cylinders 13 inches in diameter. This plan had been considered preferable to the employment of stationary power. On the South Devon line there were gradients varying from 1 in 41 to 1 in 51, with S curves of 15 chains radius. As a practical fact, it might be recorded, that the engines would take seven loaded wagons up an incline of 1 in 41, on straight portions of the line; but when they came to curves of 15 chains radius, one of the wagons had to be removed.

It was stated that, on the Lickey Incline of 1 in $37\frac{1}{2}$, an engine had been allowed to attain a speed of thirty miles in descending, and it was then brought up in 30 seconds, by the application of a peculiar kind of brake to the wheels of the engines.

With regard to zigzag inclines, for traversing mountains, it was stated that the late Mr. George Stephenson had suggested their adoption, thirteen years ago, on a line in Spain. Mr. Drane had also recommended that this method of crossing high mountains should be adopted in Ceylon; and more recently, as was well known, Mr. I. J. Berkley, M. Inst. C. E., had carried out the system successfully on the Great Indian Peninsular Railway, for ascending the Bhore Ghaut. It was thought that they were only desirable under special circumstances and in peculiar positions, where it was impossible to make a continuous line except at great cost, or by the introduction of excessively sharp curves.

Probably the steepest gradients in this country over which a large traffic was conveyed, were on the line between Manchester and Oldham, a distance of seven miles. For a mile and a quarter there was an inclination of 1 in 48 or 1 in 50. The line was then tolerably level, until, on approaching Oldham, gradients of 1 in 30 and 1 in 39 were encountered, and for about a mile and a quarter 1 in 27. This latter incline had originally been worked by stationary power and rope traction; but about five years back the locomotive had been substituted, and no difficulty was found in taking up considerable loads.

In closing the discussion, the circumstances under which steep inclines could with propriety be adopted, were considered; and it was remarked that, as a mechanical question, there was no difficulty in apportioning the power of the engine to the amount of adhesion required to traverse a particular gradient. But inclines of 1 in 10 or 1 in 17, or even 1 in 40, would only be resorted to from necessity, as such gradients were attended with a heavy cost for working expenses. On a branch of the Stockton and Darlington Railway, where there was an exceptional gradient of 1 in 40, although the traffic was all down hill, the whole of the receipts of that portion of the line, taken at one penny per ton per mile, were absorbed by the working expenses. If the loads had been up hill, it was believed that the working

expenses alone would have amounted to three pence per ton per mile, and, with gradients of 1 in 17, it was thought that this must reach one shilling to eighteen pence per ton per mile. In fact, it was questionable, under such circumstances, whether horse power and carts would not beat the locomotive in point of economy; though, of course, on a long line of railway, it would be most undesirable to introduce a break of gauge. It was undoubtedly more economical to employ locomotive power on the Whitstable branch, where the amount of traffic was so inconsiderable. On the Oldham incline, the necessity of preserving an unbroken communication was a justification for the use of the locomotive, the cost of which, in such a case, must be considerable. On the incline of 1 in 26, near Liege, a perfect system of stationary engines had been in use for many years. The Belgian Government, feeling the inconvenience of that system, had abandoned it, and substituted the locomotive; but such was the uncertainty of the power, in meeting the inequalities of the incline, that the stationary engines had been again resorted to.

*American Railways.**

An impression prevails in London that American railways are in reality, notwithstanding their fair dividends, poor properties, because the iron of which they are constructed is comparatively bad—bad as compared with the metal generally used for the rails of our lines.

It is, no doubt, the fact, that the rails of American lines generally are indifferent stuff. The iron had to come from this country; and being paid for in bonds, it is said the iron-masters took advantage of their position, and palmed off on the "Yankees" inferior material. It may be remarked that they did the same in some of our modern English railways. But let that pass. Admit that the American railways are composed of poor rails. As a question of *£ s. d.*, what does it amount to? It amounts to costly working. Nothing more. The cost is annual, and it resolves itself into an enlargement of the working expenses. Be it remarked that the American lines, as compared with the English, are extremely costly in working, which Messrs. Zerah Colburn, and Alexander Holley, two distinguished authorities, ascribe principally to this very defect of the permanent way. The dividends of American railway stocks would doubtless be higher were they to substitute good rails for bad, which we may expect they will do as they have now found their error out. The additional cost would not be much, comparatively speaking, and they would soon make it up in savings of working expenses. According to the last Board of Trade Report of English railways (by Captain Galton) the average working expenses of heavily taxed British railways were 47 per cent., while those of American railways were 54 per cent.

If American railways were as substantial as our English lines generally are, they would yield even higher dividends than they now do. Their capital accounts would not, as we have said, be much increased, while their savings in working would pay a high per centage on the additional capital. Notwithstanding their extremely high rate of expense

* From Herapath's Journal, No. 1022.

for working, the American lines in 1857 yielded a traffic profit on their capital of 6·7 per cent., while the British railways in 1857 yielded only 4·11 per cent. Thus as a property, the American lines are now more than 50 per cent. better than ours; but if the condition of their rails, &c., admitted of as much economy in working, they would be better still. They have the great advantage, which nothing can take away, of economy in capital outlay, such as avoiding frightful law, Parliamentary land compensation, and other expenses, which in this country have run away with capital wholesale without purchasing any substantial property. Nearly every old American line could not now be made for what it originally cost, the land and labor having so much advanced in value.

Some of the best paying new English railways, and there *are* paying new lines here, have been laid with poor iron, which detracts from their value but does not destroy it. They would have been better properties had they been blessed originally with better iron, the badness of which adds and will add for years to their working expenses. In course of time good rails will be substituted for defective ones, and then the profits will be as they originally would have been had the construction been fair in the first instance. Let it never be forgotten that such a thing as a *worn-out* sound rail is almost unknown. Extremely heavy rails are no good. They are destroyed as soon as lighter ones, if they are unsound. Get rails of the best material, and well laid, and no amount of traffic will produce any sensible effect upon them during a long series of years or in a life time. Ask the Stockton and Darlington Company their experience in the matter.

We have written these few remarks to correct the popular but really very silly notion that American railway dividends are unsound because their rails are unsound, the truth being that the dividends would increase were the permanent way in better order. The American heavy repairs and renewals are charges against their current revenue accounts.

"*Account of Experiments upon Elliptical Cast Iron Arches.*"*

By T. F. Chappe, M. Inst. C. E.

[Read before the Institution of Civil Engineers, March 15, 1859.]

These experiments were undertaken at the request of Mr. W. H. Barlow, M. Inst. C. E., for the purpose of ascertaining practically the safe load to which elliptical cast iron arches might be subjected, as well as the most economical distribution of the metal. The intrados of the arches was in all cases a segment of an ellipse, in order to obtain the greatest headway at the haunches. The experiments were, in each case, conducted upon two ribs, placed two feet apart from centre to centre, and resting on cast iron abutment pieces, keyed-up tight against the springings. Diagonal stays and longitudinal struts were also introduced to prevent lateral motion.

* From the Lond. Civ. Eng. and Arch. Journal, April, 1859.

The first experiment was made upon a model, one-fourth the real size, of one arch of a bridge intended to be erected over the river Trent near Newark. The (model) arch had a clear span of 14 ft. 6 in., and a rise of 16 inches; a camber of $\frac{1}{4}$ of an inch being given in fixing the halves together. The sectional area of the arch at the crown was 2·43 inches,—that of the curved rib near the springing 2 inches,—about midway between the springing and the crown 1·75 inch, and of the spandril 1·34 inch. The weight of each arch was 1 cwt. 2 qrs. 22 lbs.

The other experiments were made upon a model, one-sixth the real size, of an arch erected over the Gloucester and Stonehouse and Great Western Railways, at Standish, six miles from Gloucester. The dimensions of the model were—span 13 ft. $10\frac{5}{8}$ in., and rise 1 ft. 10 in. The sectional area at the crown was 1·25 inch, of the curved rib near the springing 1·055 inch, about midway between the springing and the crown 0·993 inch, about the middle of the upper rib 0·883 inch, and of the spandril 0·57 inch. The weight of each arch was 3 qrs. 26 lbs.

The following pressures were given as those to which the arches were subjected in these experiments:—

Experiment.	Ultimate load.		How distributed.	Pressure per square inch of sectional area.	
				At crown.	At smallest section.
No.	Tons.	cwt.		Tons.	Tons.
1	30	10	Uniformly.	8·52	11·83
2	18	0	"	6·80	8·58
3	12	0	Partially removed from the haunches.	4·54	5·72
4	5	0	On one haunch.	2·36	2·98
	3	12	At centre.	2·93	3·70
5	3	14	"	3·00	3·85

In the first experiment the ultimate pressure was not reached. In the second and third experiments one-half the arch was out of line laterally, beyond what would be permitted in practice, and was wanting in that assistance which would have been afforded in the number of ribs required for the width of a bridge, so that the ultimate pressures indicated were below what such arches might be estimated to bear. This was also the case in the two last experiments, in which the castings were faulty, and the tests such as were not likely to occur in practice. It was thought that cast iron arches of the form experimented upon, might safely be considered capable of bearing a pressure of between 8 and 10 tons per square inch of section. From the position of the fractures it was believed that the spandrils were too weak in proportion to the size of the arches.

The communication was accompanied by several tables, showing the deflections on the application of the different loads.

AMERICAN PATENTS.

List of American Patents which issued from March 29 to April 12, 1859, (inclusive,) with Exemplifications.

MARCH 29.

328. Friction Belt for Flour Mills; L. S. Reynolds, Indianapolis, Indiana.

Claim—1st, The sliding knockers, in combination with the shaft, ribs, and rods, when constructed as set forth. 2d, The springs, in combination with the knockers, when operated as set forth. 3d, The elastic bridge-tree, when used as set forth.

329. Cultivators; T. A. Robertson, Washington City, D. C.

Claim—The wing extended obliquely from the rear standard to a point, from which point projects a straight portion or divider, in combination with the oblique cutting bar, as described.

330. Stoves; H. R. Robbins, Baltimore, Maryland.

Claim—The combination of the fire chamber with the inclined front encircling transparent face plate, heat plate, pedestal with its doors, upper back encircling chamber with its doors, and divided horizontally, smoke and heat pipes, and back case or reflecting bonnet, having a conduit arranged to conduct air to the one perforated passage of the upper back encircling chamber, as described.

331. Cotton Press; J. G. Roux, Raymond, Mississippi.

Claim—The rotating platform provided with helical ledges or rails, in combination with the blocks placed on the ledges or rails, the levers, attached to the follower and the stationary press-box, arranged as set forth.

332. Railroad Cattle Guard; J. L. Rowley, Angola, Indiana.

Claim—The springs and bar, in combination with the chain fender and post, when constructed in the manner described.

333. Harvesters; I. S. and H. R. Russell, New Market, Maryland.

Claim—The peculiar arrangement of two segment level wheels, two spur wheels, an independently turning hub, having a slotted plate attached to it, and a crank arm, having a turning crank pin for giving motion to the rake round the reel in the path of a vertical circle, and over the platform in the path of a horizontal circle, as set forth.

334. Forging Machine; Erhard Schlanker, Buffalo, New York.

Claim—That portion of the hammer shaft from the centre pins extending towards the driving shaft, to be used as a lever in controlling the hammers, the centre pins being the fulcrums in connexion with the wrists and friction rollers, the location and position of the spring cams upon the duplicate face plates. The sections and the independent operating crank cams, guide plate, cranks, levers, and connecting rods, as described.

335. Coffins; I. C. Shuler, Amsterdam, New York.

Claim—1st, The manner of forming a recess in the sheet metal all around the base inside of a metal coffin; also, the arrangement of placing an iron frame, or its equivalent, into the recess described, fastening it firmly to the sheet metal all around the body of the coffin, for the purpose of stiffening the lower edges of the same. 2d, I do not claim the ribs separately, as I do not consider them tenable, but the ribs being peculiarly arranged by being placed under the flanch which supports the rim, and fastened to the frame in the recess at the bottom—I claim this peculiar arrangement for the purpose of stiffening the sides and end, so as to sustain a heavy weight of earth; also, for the purpose of preventing the sides from bilging out, when the handles are placed about an equal distance between the upper and lower edges of a sheet metal coffin. 3d, The arrangement of pressing or rolling around the outer edge of the cover of a sheet metal coffin, an inverted bead which forms a tongue on the bottom side of the cover, so arranged as to fill the groove in the upper surface of the rim, for the purpose of soldering or cementing the joints. 4th, The arrangement of placing a galvanized iron rim, or its equivalent, on the outside and over the upper edge of the walls of a sheet metal coffin, fastening the same permanently to a flanch formed all around the upper edge of the walls, for the purpose of shaping and strengthening the upper part of the coffin, and at the same time furnishing a means of securing the coffin top at the joints. 5th, I am aware that I have claimed in a former patent an iron frame as a cover over the soldered joints on the top of a sheet metal coffin; I therefore disclaim it as an entire frame: but I claim the bi-section of the frame and its re-connexion by means of spring catches at the widest part or break of the coffin.

336. Cultivator; John Smally, Bound Brook, New Jersey.

Claim—The frame, its adjustable pole, its teeth and detaching teeth, the cranked shaft, its central lever, and driver's seat, when the said seat is so situated as regards the handle that the driver can operate the latter without moving from the seat, and when all the parts are arranged in respect to each other, as set forth.

337. Seeding Machines; Michael Simmons, Ira, Illinois.

Claim—1st, The use of the eccentrically cut gear wheel, so as to enable me to get my pinion and pinion shaft on top of the frame, and above the centre of the wheel that drives it. 2d, The arrangement of the beams with their skewed shovels and adjustable connects, so that they may be transposed from side to side of the machine at pleasure, in the manner explained.

338. Spring Bedstead; C. F. Spencer, Rochester, New York.

Claim—The combination and arrangement of the spring slats with the bars and fulcra, the latter arranged to increase or diminish the effect, and horizontal slats resting at once on the free ends of each reverse series, in the manner described.

339. Smut Mill; G. H. Starbuck and D. D. Gilman, Troy, New York.

Claim—1st, The combination of the two scouring plates placed one above the other, with their roughened or burred surfaces toward each other, in combination with the funneling plates for depositing the grain at the centre of the scourers, between which it is passed, forming a double scourer attached to, and revolving with, the shaft, operated in the manner set forth. We do not confine ourselves to any number of scourers for a machine. 2d, The vertical cylindrical opening, in combination with the outer case, screen, and fans, for the

purpose of giving free discharge to all light impurities and foreign matter, and preventing the discharge of grain.

340. WATCHMAKERS LATHE; R. H. St. John, Bellefontaine, Ohio.

Claim—The combination and arrangement of the steel ring, spring, set-screws, and centering plate, as described. Also, the employment of the screw cap for clamping the article to be centered, in the manner specified.

341. CULTIVATORS; J. C. Stoddard, Worcester, Massachusetts.

Claim—1st, The share and wings or blades arranged relatively with the wheel or wheels, that is to say, placing the wheel or wheels behind the share and between the wings or blades. 2d, The adjustable rotating scrapers applied to the wings or blades. 3d, The combination of the lateral adjustable hoes, share, adjustable wings or blades, rotating scrapers, wheels, one or more, arranged as set forth.

342. CRESSET FOR HEATING BARRELS; John S. Thompson and Marvin J. Seymour, Glenn's Falls, New York.

Claim—The arrangement of the annular bed at the base of the apparatus and above the escape flue, to receive and support the barrel.

[This invention consists in having an upright cylinder or drum attached to an ordinary box stove, the stove and drum being provided with a return flue, and the stove with an annular bed.]

343. MACHINES FOR DIGGING POTATOES; J. C. Stoddard, Worcester, Massachusetts.

Claim—1st, The weed eradicator formed of the vibrating plate with serrated flanches, attached and arranged as set forth. 2d, The inclined adjustable screen box provided with a share and spur at its lower end, in combination with the endless chain of carriers arranged to operate in grooves. 3d, The combination of the weed eradicator, leveling share, inclined adjustable screen box, with share attached, and endless chain of carriers, with or without the receptacle. 4th, The adjustable or movable roller shaft applied to the machine, and arranged as set forth.

344. MANUFACTURE OF WOOD SCREWS; N. G. Thom, Cincinnati, Ohio.

I do not confine myself to any particular form of construction as to size, shape, &c., as these may be varied indefinitely, and the same construction is applicable to coach or lag screws, or any other screw in which wood, or other yielding substances, constitute the material into which the screw is driven.

Claim—The described wood screw, which consists in its having two or more parallel threads that terminate at or near the point of a tapering core, as described.

345. SADDLES; S. E. Tompkins, Newark, New Jersey.

Claim—The bow-pieces, connected with the sides and provided respectively with the head and cantel, in connexion with the central bow-piece or "safety guard," when the parts are placed relatively with each other, so as to admit of being cast in one piece. Further, in connexion with the saddle-tree, formed as above, the crupper loop attached to the cantel bow-piece, by means of the plate.

346. STOVES; F. E. Tupper, Nashua, New Hampshire.

Claim—The arrangement of the air chamber with its air passages or tubes and apertures, and openings, with the casing, supporting, and deflecting collar, in the manner set forth.

347. HARVESTERS; S. W Tyler, Greenwich, New York.

Claim—Giving such a shape to the portions, a and b, of the finger-bar, and to the flanched portions or heads of the fingers, that the same set of rivets will unite all the said parts with each other into a fingered bar of unusual stiffness, strength, and narrowness, and at the same time form a dovetail groove for the reception and guidance of the cutter bar.

348. MACHINE FOR ROLLING WHEEL TIRES; Nathan Washburn, Worcester, Massachusetts.

Claim—The combination of a set of reducing rollers, a series of adjustable carrying rollers, and a frame or holder, supported so as to be capable of rising upward within the wheel tire in proportion as the diameter of the inner periphery of the said tire may increase during the process of rolling the tire, and having the said carrying rollers arranged and made adjustable with respect to it and the reducing rollers, in manner specified.

349. CLOD CRUSHERS; E. B. Way, Jerseyville, Illinois.

Claim—The employment of the oblique-sided double tapered slats, in combination with the rims, so that the clods that wedge between the slats will be carried up, and then dropped, and broken within the wheel.

350. SAUSAGE-STUFFER; John Wagner, Pittsburgh, Pennsylvania.

Claim—The arrangement of using in addition to the operating crank for the forward motion, another operating crank for the backward motion, when applied to the wheel gear arrangement of worm and wheel, in the manner described, viz: when set on the spindle of the screw wheel.

351. HARVESTING MACHINE; Wm. Webber, Jr., and John Webber, Rockton, Illinois.

Claim—Operating the rake of a harvester by means of the horizontally oscillating arms, the rod, and the latch, arranged in the manner set forth.

352. STOVES; J. Whitehead, South Paris, Maine.

Claim—The combination with the fire chamber described, and with an oven having hollow walls filled in with a non-conducting material, of a removable fire chamber casing, which has hollow walls, filled in with a non-conducting material, and is in shape, externally, nearly the counterpart of the fire chamber, and serves for encasing the whole of the exposed portion of the fire chamber, and at the same time allows access to the holes in the top of the fire chamber and to the fuel door thereof, as set forth.

353. FLY-TRAP; Elisha D. Blakeman, Assignor to Jacob J. and Levi Auchampaugh, New Lebanon, New York.

Claim—The combination and arrangement of the poison cups with the conical chamber and bed-plate, as set forth.

354. MACHINE FOR ROLLING IRON; Henry B. Comer, Assignor to self and Joseph S. Lewis, Temperanceville, Pennsylvania.

Claim—Furnishing rolls which are placed in front of each other and on parallel lines with guides placed between each set of rolls, said guides being so constructed that they will guide and change the position of the iron as it passes from one set of rolls on to another set, as described.

355. FOOT-SCRAPER; W. L. Williams, City of New York.

Claim—The employment or use of the scraper and the brushes, either with or without the brush, arranged as set forth.

356. Method of Operating the Knife in Riving Shingles; John Wood, Brooklyn, New York.

Claim—Giving the frame in which the reciprocating knife gate is placed an intermittently vibrating movement simultaneously with the feed movement of the bolt.

357. Self-feeding Press for Printing Cards and Bill-heads; Nathan Ames, Saugus, Assignor to self and Nathaniel Evans, Jr., Boston, Massachusetts.

Claim—1st, The little cams or projections arranged in reference to the ink rollers, and operating in connexion with them and the vibrating type-bed, as described. 2d, The combination and arrangement of the spring, hinged piece, type-bed, and spring, in the manner set forth. 3d, Attaching the type-bed at one of its sides only to the arm, so that the inking rollers may pass over and under it. 4th, The pitman, r', screw, r, top piece, x, slot, j, and slides, e e', when arranged as set forth. 5th, Attaching the feeding plate, f, to the slide, e, and causing the latter to move in the groove, g, so that while the upper side of f, bears on the surface of x, the thickness of e extending below it, prevents the card from ever getting between the surfaces of f and x. 6th, The adjustable guide, arranged as described. 7th, The adjustable lateral guides, arranged as set forth. 8th, The card-pusher provided with the slots, in the manner described.

358. Car Coupling; James W. Carrier, Assignor to self and Able B. Howe, Springfield, Massachusetts.

Claim—The sliding bunter, a, connexion pin, d, pin, p, springs, r and l, straps, m, sliding pin, b, springs, k k, rack, f, pinion, g, ratchet, s, pawl, t, and pin, v, arranged as described.

359. Corn Shellers; Charles W. Carter, Westville, Indiana, Assignor to Lester L. Bond and George Coatsworth, Chicago, Illinois.

Claim—The sectional truncated cone, constructed with the pintle, guide spring, and hinge, and arranged to operate in combination with the outer cone, in the manner specified.

360. Machine for Preparing Mouldings for Picture Frames; Eleazer Gardner, Assignor to Gardner & Decker, City of New York.

Claim—The revolving rollers, arranged as described, in combination with the scraper, for the purpose specified.

361. Retorts for Distilling Coal Oil; Joseph E. Holmes, Newark, Ohio, Assignor to self and Joseph Palmer, City of New York.

Claim—1st, The combination with the internal vapor pipe of a leg, so applied as to keep the mouth of the said pipe in the upper part of the retort, either by the direct action upon it of the force of gravitation, or by its dragging in the coal or other matter in the lower part of the retort. 2d, The arrangement of the steam pipe to communicate through the hollow journal, with a passage in the leg of the vapor pipe, for the admission of steam directly into and among the charge.

362. Camera Stands; Henry J. Lewis, Brooklyn, New York, Assignor to self and Richard A. Lewis, City of New York.

Claim—The combination of the braces and screw clamping blocks, or their equivalents, with the legs, in the manner specified.

363. Milk Pan; E. L. Pratt, Assignor to self and R. B. Fitts, Philadelphia, Pennsylvania.

Claim—A pan with a detachable or hinged cover, forming, when combined, a vessel closed, with the exception of a series of minute perforations below for the access of cold air, and a suitable distance above the latter, another series of perforations for the exit of warm air and gases, and otherwise constructed as set forth.

364. Seeding Machines; Alonzo R. Root, Assignor to Rufus S. Rickey, Keokuk, Iowa.

Claim—1st, In combination with the hopper and the revolving tubes or arms, the regulator, constructed as described. 2d, In combination with the regulator and revolving tubes or arms, the vertical and inclined partitions and lip, for the purpose of directing the seed to be sown from the hopper to the openings in the arms or tubes, and to prevent the seed from escaping unduly through the arm or tube, for the time being, immediately under the lamp.

365. Grinding Mills; George Selser, Assignor to self, J., and W. Cook, Philadelphia, Pennsylvania.

Claim—Attaching the hollow steel burr to the spindle, by screwing or otherwise securing the end of the latter to a plate, which is fitted snugly to the inside of the burr and shoulder on the spindle bearing on the top of the burr, as set forth.

366. Marine Propeller; John Taggart, Roxbury, Assignor to self and George R. Sampson, Brookline, Mass.

Claim—The conjoint action of two separate rotary or screw propellers, respectively operating or screwing into the water and air, arranged as described, and propelled by a steam engine or motor within or carried by the vessel. Also, arranging the air screw propeller on its axis, at an inclination upward from the keel or plane of flotation of the vessel, in order that the said propeller, while being rotated, may operate, not only to draw the vessel ahead, but to lift her bow more or less out of water.

367. Gas Retorts; Davis L. Weatherhead, Assignor to self and S. E. Southland, Philadelphia, Pennsylvania.

Claim—The cap with its box or reservoir when arranged in respect to the lower chamber, the upper chamber, and exit pipe of the retort, as set forth.

368. Saw-set; Olive Ann Brooks, Great Falls, New York, administratrix of the estate of Lebbeus Brooks, deceased, late of Great Falls, aforesaid.

Claim—The arrangement and application of the benders and bending screw together, and with respect to the two handles, as set forth, whereby the centre of motion of the benders is at the place of contact, or the vertex of the angle of their upper surfaces, and no fulcrum pin is employed for the support and connexion of the levers.

Additional Improvements.

1. Tools for Tenoning Spokes; J. J. Croy, Caledonia, Missouri; patented February 3, 1857; additional dated March 1, 1859.

Claim—1st, The adjustable gauge attached to the tube, as set forth. 2d, The employment or use of the temper or set-screws applied to the tube, as set forth. 3d, The gauges, h, fitted in the bars of the clamp cutter head, arranged as specified.

2. Locks; H. W. Covert, Assignor to M. Briggs, Rochester, New York; additional dated March 1, 1859.

Claim—The combination of the disc and centre, toothed or corrugated, as represented, for the purpose of

fastening them securely together; but I do not confine myself to any particular size, or shape, or number of teeth, nor to any particular position on the disc or centre.

3. Fly-trap; Wm. Riley, Madison, Miss.; patented April 27, 1858; additional dated March 1, 1859.

Claim—The cover or shade, the rim or front, and the pan, as described.

4. Bedstead Fastening; Oliver Robinson, Rochester, New York; patented December 28, 1858; additional dated March 22, 1859.

Claim—Constructing the locking bolt of a flat or rectangular form, so as to work against the surface of the side-board, to obviate the reducing of the bearing surface of the recess of the wrench, and hold the parts to the required position without the usual guide pin. Also, elevating the hooks above a right line through the centre of the bolt. Also, uniting the point of the circular wedge with the stock of the wrench, whereby greater strength and a better adaptation to the recess or seat of the same is secured. Further, adapting the cam or raised part of the wrench lever to pushing and holding forward the bolt for ready connexion with the pin.

5. Railroad Car Stoves; James Spear, Philadelphia, Pennsylvania; patented June 1, 1858; additional dated March 22, 1859.

Claim—The combination of the openings in the side plate with the back fire-plate in connecting tube, with the centre plates, constructed in the manner set forth. Also, the openings in side plate with the centre plate, constructed in the manner set forth. Also, the flue or opening from the front plate to the top plate, constructed in the manner set forth.

6. Cooking Stoves; James Spear, Philadelphia, Pennsylvania; patented July 7, 1857; additional dated March 22, 1859.

Claim—1st, The combination of the cone damper with the smoke-pipe and the top plate. 2d, The combination of the head or deck collar with the cold air pipe and the smoke-pipe, constructed in the manner set forth.

7. Machine for Making Axes; Jonas Simmons, Cohoes, New York; patented March 1, 1853; additional dated March 22, 1859.

Claim—The groove, the arm, with the ton, in combination with each other in the manner set forth.

Re-Issues.

1. Window Fastener; C. R. Edwards, Niagara City, New York; patented July 8, 1856; re-issued March 1, 1859.

Claim—The employment of a single shaft, operated internally, and operating externally upon a window blind, when said shaft is made to effect the double purpose of operating both the blind and its slats, and this whether I construct and arrange the hinge and levers in the manner specified or not.

2. Grinding Mill; G. Sanford, Poughkeepsie, New York; patented March 9, 1858; re-issued March 1, 1859.

Claim—Constructing a grinding mill with flat plates dressed on both sides, having a longitudinal reciprocating, vertical, and oscillating motion, in combination with flat stationary plates likewise dressed on both sides, the whole constructed and operated as described. Also, the notched form of the upper edges of the plates, for the purpose of preventing the mill from choking and to facilitate the feeding of the article to be ground between the grinding surfaces.

3. Handles for Table Cutlery; J. W. Gardner, Shelburne Falls, Massachusetts; patented February 1, 1859; re-issued March 8, 1859.

Claim—Forming the handle of two parts which are encompassed at their junction by a ferule, the tang passing through both parts of the handle and the parts being secured thereon by a nut or washer or a rivet.

4. Machinery for Preparing Oval Pictures; Wm. Gardner, City of New York; patented August 17, 1858; re-issued March 15, 1859.

Claim—A lathe with a face plate revolving in an oval path, in combination with a scraper adapted to the form of the desired moulding of the oval frame, when the said scraper is so arranged as to be self-adjusting laterally with the said moulding.

5. Harvesting Machines; W. A. Kirly, Buffalo, New York; patented September 2, 1856; re-issued March 15, 1859.

Claim—The combination of the single plate and main wheel. Also, the combination of the main wheel, single plate, and rim, when connected together and operating in the manner set forth. Also, placing the vibrating wheel on the outside of the frame, or so that the outside of the frame does not bear on the outside of the wheel, in combination with the triangular-shaped frame on the inside of the wheel. Also, hanging the seat to the plate and to the standard, in the manner set forth. Also, a hinged lever seat and outside stirrup or supporter, in combination with a wheel having no outside frame or support.

6. Machinery for Enameling Mouldings, &c.; Robert Marcher, Cornwall, New York; patented October 21, 1858; re-issued March 15, 1859.

Claim—The employment of a plate whose lower edge is formed the reverse of the transverse form of the moulding to which it is applied, when such plate is made self-adapting to the surface of the molding during the longitudinal movement. Also, the employment of a hopper to contain the composition for enameling when the lower edges of the end plates thereof are formed the reverse of the transverse form of the moulding, and the moulding to be enameled is employed as the bottom of such hopper.

7. Amalgamator; Lewis Solomon, City of New York; patented December 7, 1858; re-issued March 15, 1859.

Claim—1st, The use of elongated amalgamating chambers, when arranged in the manner specified. 2d, The arrangement of the amalgamating chambers within a heated chamber.

8. Steam Gauges; Thomas Stubblefield, Columbus, Ga.; patented July 18, 1854; re-issued March 15, 1859.

Claim—The combination of a case perforated at both ends with a spring valve, the spring forming the sides of the valve being arranged so as to cut off communication between the perforations in the opposite ends of the case, and perform the duty of a manometer spring, as described.

9. Smelting Furnace; Charles C. Alger, Newburgh, New York; patented June 30, 1857; re-issued March 29, 1859.

Claim—Constructing furnaces with the hearth and boshes of an elliptical or elongated form, in combination with the application of the blast at the sides, so arranged as to introduce the blast in the direction of the

breadth, and for the purposes specified. Also, in combination with the hearth and boshes made of an elliptical or elongated form, the construction of such furnaces with two mouths, one at each end, for working and tapping, as specified.

10. Reclining Chairs for Railroad Cars and other uses; Isaac L. Devoe, Staten Island, New York, Assignee through mesne-assignment of Samuel M. Perry, City of New York; patented July 27, 1852; re-issued March 29, 1859.

Claim—1st, To so combine the back with the two end frames by means of bars jointed to it by one or two studs and one or two series of notches, or equivalents therefor, that the said back, when not a reversible one, may be raised and inclined in various positions, so as to not only support the back, but the head of a person at the same time. 2d, Making the back reversible by means of two series of notches and two sets of studs, or equivalents, arranged on opposite sides of the chair, and made to operate as specified. 3d, The improvement of making each arm or bar with a rack or racks of teeth or succession of notches, or equivalents therefor, for the purpose of adjusting and securing the backs in the desired position, whereby the occupant can alter or vary said position without rising from the seat.

Designs.

1. Stereoscope Case; Alex Beckers, City of New York; dated March 1, 1859.
2. Table Bells; H. C. Foote, Wallingford, Connecticut; dated March 8, 1859.
3. Parlor Cooking Stove; David Hathaway, Assignor to Fuller, Warren & Co., Troy, New York; dated March 22, 1859.
4. Cooking Stove; A. C. Barston, Providence, Rhode Island; dated March 22, 1859.
5. Hat-racks; Edward Reynolds, Assignor to Thomas W. Brown, Boston, Massachusetts; dated March 29, 1859.

APRIL 5.

1. Arrangement for Extinguishing Fires in Steam Vessels; Wm. Arthur, Brooklyn, New York.

Claim—The application of the waste water discharged from the air-pump raised to such height as to flood the steam vessel with water for the purpose of extinguishing fire, instead of discharging it, as usual, as waste water from the sides of the vessel.

2. Machine for Wringing Clothes; S. A. Bailey, New London, Connecticut.

Claim—The employment of the cylindrical wooden spring piece, which is divided in two parts at its centre, each part being slotted from the place of division toward its outer end, the same being covered by a rubber cylinder.

3. Condensing Covers; Abel H. Bartlett, Spuyten Duyvil, New York.

Claim—The reservoir and the pipes, when made and arranged as specified.

4. Apparatus for Exhibiting Stereoscopic Pictures; Alex. Beckers, City of New York.

Claim—1st, Placing the endless belt, chain, band, or apron, in such a position as to form an acute or obtuse angle with the base of the box or chamber of the apparatus. 2d, Placing the slides or frames holding the pictures in such a position as to form acute or obtuse angles with the endless belt or with the line of motion.

5. Metallic Piston Packing; Asa G. Bill, Cuyahoga Falls, Ohio.

Claim—The arrangement of the arms on the central hub of the piston, which act on a ring, and which are operated by means of a cam.

6. Reefing Sails; Robert B. Benson, City of New York.

Claim—Reefing the sail from the deck by the use of a supplementary foot-rope, or its equivalent, in combination with the auxiliary sheet and with the reefing lines.

7. Gas Burners; Wm. Blake, Boston, Massachusetts.

Claim—The arrangement of one or more conduit tubes in the burner or jet chamber, and with respect to the base of the said burner or jet chamber and its inlet passage or passages. And in combination with the arrangement of the inlet conduit or conduits, in such manner as to cause the gas to pass around in the expansion jet chamber in one or more helical currents, I claim an annular or ring exit orifice, whereby the current or currents of gas may be thrown out of the burner in one or more helical streams, so as to equalize the height of the flame and prevent it from flickering.

8. Life-boat; Mannervillette E. D. Brown, Utica, New York.

Claim—The construction of a life-boat with three recesses, as set forth. Also, in combination with the foregoing, the making a groove in the rudder iron, and a peg in the rudder bolt, for the purpose set forth.

9. Pumps; Wm. R. Brown, Cleveland, Ohio.

Claim—1st, The bi-cuspid valve, constructed as described. 2d, The arrangement of the bi-cuspid valve, in connexion with the oscillating pump.

10. Hydrants; Joel Bryant, Brooklyn, New York.

Claim—1st, In the construction and use of hydrants, the shaft (whether hollow or solid, naked or encased), when used for obtaining water, as described. 2d, In connexion with the said shaft, the perforated open top and banded chamber valve, constructed as described.

11. Paper-folding Machines; Cyrus Chambers, Jr., Philadelphia, Pennsylvania.

Claim—1st, The register pins, so constructed and so attached to a paper-folding machine that they shall retain a position proper for the adjustment of the sheet, and yield by the movement of the latter. 2d, Adjusting one of the register pins laterally and longitudinally, independently of the other pin, by means of the slides, or their equivalents. 3d, Adjusting both pins simultaneously, both laterally and longitudinally, by the frames, x and y, or their equivalents, the frame x, being adjustable in one direction on the frame y, and the latter, together with the frame x, being adjustable in another direction on the frame of the machine, or any attachment thereto. 4th, Any convenient number of rods terminating at one of the folding rollers, the ends of the rods passing into grooves in the said rollers, for the purpose specified. 5th, The adjustable stop with its inner edge of a curved or angular form, or otherwise so constructed, that the end of the folded edge

only of the sheet shall be in contact with the said stop, for the purpose specified. 6th, The plunger with its adjustable plate, 8, in combination with the adjustable plate, 9, the said plate being arranged substantially as set forth. 7th, The curved wires, or their equivalents, attached to the machine in any convenient manner, situated under the folding apparatus and adjacent to the trough, for the purpose specified. 8th, The combination of an alarm or indicating apparatus with a paper-folding machine, when the said indicator is operated by a sheet folded by the machine. 9th, Causing the sliding board to move along the trough with a diminution of friction as the folded sheets acccumulate, by means of the springs attached to the said board and arranged to bear against the wedge-formed or inclined strips, 5, as set forth.

12. Power Looms; Wm. H. Cheetham, Jr., City of New York.

Claim—1st, The employment of a frame to contain the shuttles which are inoperative, which is constructed to hold the said shuttles, arranged in proper order, in two tiers, and is applied in such a manner in front of either or each set of shuttle-boxes of the loom, as to be capable of receiving in one tier the shuttles which are required to be thrown out of operation, and of supplying from the other tier the proper shuttles to take their places. 2d, The box, M, applied and operating in combination with the shuttle frame. 3d, The pushers, applied and operating in combination with the shuttle frame and box, as described.

13. Pumps; John B. Christian and Abner Beeler, Mount Carroll, Illinois.

Claim—The construction, arrangement, and combination of the pumping cylinders, G G, and cylinders, B B and I I, in the manner specified.

14. Valve Arrangement of Steam Engines; Henry Clayton, Tamaqua, Pennsylvania.

Claim—1st, The employment, in combination with a slide valve, of one or more shutters applied and secured thereto to vary and regulate the area of opening of the port or ports. 2d, Combining the two shutters (when two are employed,) with the slide valve, by means of two screws, one of whose stems passes through the other, which turns in a bearing on the back of the valve, and both of which stems pass through one end of the valve chest. 3d, The valve with its screwed stern, or its equivalent, and spring, arranged and applied as described.

15. Polishing Rice; Levi H. Colburn, Baltimore, Maryland.

Claim—The process of breaking the outer covering and moistening the inner coating of rice, and polishing the same, as set forth.

16. Steam Engines; Jacob A. Conover, City of New York.

Claim—Combining with the mechanism which connects the governor with the throttle valve, to regulate the admission of steam to the engine, a mechanism which disconnects the throttle from the governor to permit it to be closed by an independent power, to shut off the steam from the engine, as described.

17. Shoe Peg Machine; Caleb Cook, Stittsborough, New Hampshire.

Claim—1st, The discs, as described. 2d, The method of holding the peg-wood together by the chain and drum, and friction appliance. 3d, The method of holding the peg-wood firmly in place by pressing it up against the guide-piece, D, by means of the spring, and the lever and posts. 4th, The method of relieving the upward pressure against D, for the purposes of the feed motion by means of the system of levers, as described.

18. Mole Ploughs; Jacob Creamer and Thomas W. Ricards, London, Ohio.

Claim—The arrangement of the beam, screw, wheel, and shaft, upon the sliding shoe, constructed as described.

19. Pump; James E. Cronk, Poughkeepsie, New York.

Claim—The peculiar form and arrangement of the diaphragms with the shells, as described, and the ring forming a chamber between them, with the discharge therefrom.

20. Manufacture of Artificial Leather; Ephraim and John R. Cushman, Amherst, Massachusetts.

Claim—1st, Holding the felt up to the roll, for the purpose set forth. 2d, Removing the adhering fibres from the surfaces of the felt before it reaches the felt washer, by means of the scratcher, or its equivalent.

21. Ice-pitcher; Charles Dickinson and Wm. Bellamy, Newark, New Jersey.

Claim—An ice-pitcher provided between its walls with a hard non-conductor, so as to prevent the walls from indentation or fracture from within or without, while it also assists refrigeration, as described.

22. Grate Bars; James Easterly, Albany, New York.

Claim—The corrugated grate bar, constructed in the manner specified.

23. Steam Boilers; E. M. Ivens, New Orleans, Louisiana.

Claim—The arrangement of a cylindrical or annular water drum (having a forced circulation) within the flue of an ordinary flue boiler, in the manner set forth.

24. Boot-trees; Winthrop B. Fay and Russell W. Collier, Upton, Massachusetts.

Claim—The elastic plates attached to the sides of the foot-piece in connexion with the adjustable bars, arranged as set forth.

25. Billiard Table; Fritz Fedderke, City of New York.

Claim—Constructing a billiard which may be changed from an American into a French billiard, by effecting a perfect continuation of the cushion throughout the whole length of the same, by means of cushion pieces inserted between and fastened to the jaws by a handle operating upon a fork lever, latches, or bolts, and springs, and re-converting the French billiard thus formed into an American billiard by renewing the said cushion pieces by the same means.

26. Water-wheels; Josiah B. Fitch, City of New York.

Claim—The combination of the wheels, one or more, and gate, arranged relatively with each other and placed within a proper case, which is fitted within a penstock or flume, as set forth.

27. Clothes Frame; H. M. Fletcher, Newport, New Hampshire.

Claim—1st, The plank, A, in combination with the plank, B, the bearings, and the sectional shafts, constructed as described. 2d, The sectional shaft, constructed and operating as described. 3d, The reel frame composed of the parts, in combination with the sectional shaft, the plank, A, the plank, B, the bearings, with their corresponding mortises, the spring, the pulley, and the cord, constructed as described.

28. Mechanism for Obtaining Rotary Motion from Reciprocating Rectilinear Motion; Alvin K. Gilmore, Bath, Maine.

Claim—The combination of the bifurcated slider, two pulley sectors, their double pawls, or mechanical

equivalents therefor, and the wheel, the whole applied to one shaft, and made to operate in manner set forth. Also, in combination with the pawls and their disc wheels, the disc-moving mechanism, consisting of the levers, bent arms, sliders, forked arms, slide rod, and shifting lever, arranged as explained. Also, in combination with each double pawl and the shaft, a disc or wheel having studs or stops, and being applied to the shaft and friction wheel, as described.

29. Fire Escape; J. M. Hancock, Lansing, Iowa.

Claim—The flying pinions, in combination with the detent, the driving wheel, the spring-brake, and block brake, as described. Also, in combination with the described piece of mechanism, the table, or its equivalent, as described.

30. Ship Propelling Apparatus; A. E. Harding, Middletown, Ohio.

Claim—1st, The rollers, arranged as described. 2d, The arrangement and combination of the propeller chambers, B B, air tubes, openings, chambers, E E, pistons, gates, pipe, and propellers, arranged as described.

31. Stump Extractor; G. D. Harris, Fitchburg, Massachusetts.

Claim—A stump puller having a pulley and two conical shafts, one shaft for winding the chain with a variable speed, the other shaft for correspondingly winding the rope, and otherwise constructed as described.

32. Rendering Friction Matches Water-proof; L. J. Henry, Assignor to Daniel Benrimo, City of N. York.

Claim—Rendering friction matches partially or entirely water-proof by the application of the melted coating, in the manner specified.

33. Rotary Engine; Daniel Hughes, Rochester, New York.

Claim—The oscillating shoes, applied and operating in combination with the oscillating abutments and the rotating piston hub, as described. Also, the discs, having openings and sockets, applied in combination with the rotary piston hub, the cylinder heads, and the main shaft, as described.

34. Treatment of Peat for Composting; J. Burrows Hyde, Newark, New Jersey.

Claim—The use of peaty matter as a basis for admixture with other richer manures, when said peaty matter shall have been dried and finely powdered, previous to admixture.

35. Rotating Shot and Shells; J. B. Hyde, Newark, New Jersey.

Claim—The use of tangential holes, bored from the outer surface into the solid portion of the front end of the shot, for receiving the rotating composition. Also, the use of the adjustable tubes or cases of rotating composition.

36. Moulds for Forming Artificial Teeth; A. Lewenberg, City of New York.

Claim—A divided socket or holder receiving the pins of artificial teeth, so fitted as to be removable from said pins prior to taking the teeth out of the mould, for the purposes specified.

37. Extension Tables; Anthony Isky, Lancaster, Pennsylvania.

Claim—The arrangement of the pivoted cross slats affixed on each side of the central partition in the table frame and the double wings, when hinged, so that the wing may be turned over on to the slats, when extended, as also the adjustment and combination of the several parts described.

38. Tanning; Hiram Johnson, Farmersville, New York.

Claim—The use of a solution of quick lime as a tanning ingredient to be used in connexion with any of the tannic acids or tanning ingredients now in general use, not confining myself, however, to the exact proportions specified.

39. Lathe Clutch; Wm. Johnson, Lambertville, New Jersey.

Claim—The combination of toothed wheels and arms, actuated by a single screw shaft, so as always to present three several points of pressure centrally upon the body to be turned or wrought.

40. Metallic Cotton Bands; Richard Lewis, Charleston, South Carolina.

Claim—In the device, plates, A B, with slots, projections, opening, legs, and shoulders, in combination, constructed in the manner described.

41. Metallic Cotton Bands; Richard Lewis, Charleston, South Carolina.

Claim—The plates, A B, opening, projections, and shoulders, in combination, constructed as described.

42. Mode of Attaching Horses to Vehicles; E. D. Lockwood, Penfield, New York.

Claim—Attaching the strap to the thills, by means of the perforated plate and the pins placed in the recesses of the thills, and having wide and narrow parts, as described.

43. Water-tight Doors for Marine Safes, Lockers, &c.; M. Ludlam, Fair Haven, Vermont.

Claim—The double door, constructed and operating in combination with the outer or surrounding frame work, and independent interior frame, or its equivalent.

44. Refrigerators; Jacob Marx, City of New York.

Claim—The combination and arrangement of ice chamber, the gutter, pipe, the water-tank, and provision chamber, as specified.

45. India Rubber Soles for Boots and Shoes; Charles McBurney, Roxbury, Massachusetts.

Claim—A sole made of vulcanized india rubber, and having the holes for the reception of the pegs formed in the mould in which it is vulcanized.

46. Sandals; Wm. McConnell, Philadelphia, Pennsylvania.

Claim—A sandal consisting of three blocks of wood, or other suitable material, attached to an elastic metal strip, when the said blocks are so situated in respect to each other, that one shall coincide with the toes, the other with the ball, and the third with the heel of the wearer's foot, as specified.

47. Seeding Machines; O. H. Melendy, Delhi, Iowa.

Claim—The levers, slides, and projections on the wheel, in connexion with the bars connected by the links, arranged as set forth.

48. Steam Boilers; Gregor Menzel, Milwaukie, Wisconsin.

Claim—The arrangement in an upright cylindrical boiler of a fire-box and series of ascending tubes, a smoke-box, a single or double circle of descending tubes, a flue, H, and flue, I, in combination with jacket, with or without horizontal steam dome. I do not claim, irrespective, a circulation pipe for an upright boiler. But I claim the arrangement of my circulation pipes which hang loose and inside the cylinder, openings, and steam dome, in the manner described.

49. Lamps; A. H. North, Hartford, Connecticut.

Claim—The rotating plate with the elongated scroll teeth, in combination with the vertical gears and the vertical actuating gear, in the manner described

50. Machine for Making Patterns for Cog-wheels, &c.; Washington Obenchain, Logansport, Indiana.

Claim—1st, The mode of adjusting the arm vertically by means of a screw, in combination with the upright, which is also adjustable about a vertical axis. 2d, The track frame when adjustable laterally for the purpose of giving taper to the piece cut. 3d, The arrangement and devices for adjusting the cutter.

51. Pumps; J. K. O'Neil, Kingston, New York.

Claim—The combination and arrangement of the vibratory arm, rod, stem, guide, and spring, for controlling the valve from the top of the well, as described. Also, constructing the pistons with raised rims and guiding edges upon the heads thereof, in combination with the packing, coiled springs, and central disc, arranged in the manner set forth.

52. Rope Machinery; J. W. Peer, Troy, New York.

Claim—Conducting the strands from their bobbins round the exterior of one side of the flyer, and from thence over guide rods, or their equivalents, to and through a hole or guide on the opposite side of the flyer.

53. Pencil Cases; D. A. Peirce, East Greenwich, Rhode Island.

Claim—Constructing the end of the tube with a screw-thread, and forming the row of teeth therein, in the manner described.

54. Arrangement of Machinery for Operating Corn Shellers Separately or Jointly with a Fan or Cutters; W. L. Potter, Clifton Park, New York.

Claim—The arrangement of the fan and the gearing in relation to the shafts, so as to connect and disconnect the same, for the purpose of allowing either the fan or the cutting apparatus to be operated with the sheller, or the sheller to be worked independently of either.

55. Pump; John Powers, City of New York.

Claim—Arranging two forcing valvular pistons back to back in line with each other, and combining them by means of a piston rod, or other connexion common to both, with the arm of the brake at a point between the two pistons, so that both may be operated by the same arm of the pump brake. Also, combining the pump brake with the duplex pump barrel, by means of an air vessel, constructed and located so that it forms a secure fulcrum for the brake, and affords a passage through it for the arm of the brake to the piston rod upon which it acts.

56. Steam Boilers; Samuel Pierce, Troy, New York.

Claim—The employment of air tubes placed within the fire chamber of a steam boiler, in combination with the surrounding water tubes connected at both ends with the water spaces of the boiler, and connected with the inner air tubes by means of hollow stay-bolts, when the air and water tubes so combined are arranged as specified.

57. Machinery for Laying Rope; G. W. Pitman and W. C. Boone, Bushwick, New York.

Claim—The laying and unlaying of the strands to forward the twist, as described. Also, the ring guide, applied in combination with the bobbin to the nearest flyer, as set forth.

58. Cheese Cutter; T. H. Pollock and Daniel Bliven, Greenville, Connecticut.

Claim—The platform being provided with a rim and with projection, in combination with the turn-table, or its equivalent, to operate as specified. Also, the arrangement of the knife, the cutting edge of which makes an obtuse angle with the rack to which it is attached, and operates in combination with slots, in the manner specified.

59. Rail-splicing Chairs; R. S. Potter, Chicago, Illinois.

Claim—A clamp wedge operated by the same bolts as a clamp and as a wedge acting upon each rail equally, in combination with the chair guard.

60. Machine for Pointing and Splitting Shoe-pegs; Jesse Reed, Marshfield, Massachusetts.

Claim—1st, A traversing carriage, in combination with a revolving table, so arranged that after a series of cuts has been made in one direction, the table may be revolved 90 degrees preparatory to making the second series of cuts. 2d, The device for traversing and returning the carriage, consisting of the following parts, or their substantial equivalents, in combination, viz: the screw shafts, the block, the lever, with its spring and tripping arrangement. 3d, The device for automatically revolving the table, consisting of the spring and the parts, m n o p and k, or their equivalents. 4th, The grooving and splitting irons traversing the block, in combination with the holders, or their equivalents. 5th, Feeding the block by means of the continuous revolution of a screw operating through a spring, so that when the block is released the feed is instantly given to it, in the manner set forth.

61. Keeping Air-springs Supplied with Air; S G. Randall, Middlebury, Vermont.

Claim—Combining an air-spring and an air-pump, or its equivalent, with a car or carriage, or other moving conveyance, so that the motion of said car, carriage, or other conveyance, shall through such air supplier keep the air-springs supplied with air.

62. Air Engines; B. F. Rice, Clinton, Massachusetts.

Claim—Giving to the plungers or piston of air engines a rotary motion, for the reasons specified. Also, giving to the plungers or pistons of air engines a rotary motion, in combination with the means employed for keeping the entire surfaces of the plungers or pistons continually lubricated, in the manner set forth.

63. Bands for Binding Grain, Hemp, &c.; Andrew Ralston, West Middletown, Pennsylvania.

Claim—Furnishing cords or straps used for binding grain, hemp, &c., &c., with a T-shaped clasp, as described.

64. Car Couplings; J. C. Ransier, Lyons, New York.

Claim—1st, Clevis, B, in connexion with fulcrum, E, key-bolt, D, for the purpose of a connecting link between railroad cars, so constructed and arranged that said clevis or link will encircle and revolve up and down, and sway to the right and left over the outside of bumper plate or plates and the body of the bumper, and otherwise arranged as described. 2d, Revolving arms, or their equivalents, in combination with the dog, for the purpose of aiding in casting off the opposite clevis from the hook, in the process of disconnecting or uncoupling; also, for a rest for, and in aiding in, throwing clevis on the same bumper forward from its upright

position in the process of effecting a coupling. 3d, Hook, c, or its mechanical equivalent, placed on top of the upper bar, and in rear of the top shoulder of fulcrum, for the purpose of receiving the curved point of the opposite clevis in the process of coupling. I do not intend to confine myself to rod or shaft for the purpose of turning dog, o, against the shoulder of arms, for the purpose of raising the points of said arms, in the process of casting off the opposite clevis in the process of uncoupling, as described, as other well known modes of screw or lever power can be employed with equal effect.

65. Capstan; Jesse Reed, Marshfield, Massachusetts.

Claim—The adjustable detached fleeter, operating as set forth. Also, the employment of the double inclines, whereby I am enabled to fleet the cable, whatever may be the direction in which the capstan is turned.

66. Printers Type Case; T. N. Rooker, City of New York.

Claim—The method of arranging the compartments of a type case, that is to say, placing at the side of the lower case character its corresponding upper case character, for the purposes set forth.

67. Pegging Machine; James and A. W. Sangster, Buffalo, New York.

Claim—1st, The combination of the wheels, P and Q, the ratchet, and the peg-wood, with the awl, peg-driver, the knife, and the shoulder, when arranged substantially in the manner specified. 2d, Placing the adjustable wheel in arrangement with those parts which form the subject of the first claim, for the purpose of regulating the distance at which the pegs are to be driven from the edge of the leather or material pegged.

68. Machine for Making Hoes; Henry Sauerbier, Newark, New Jersey.

Claim—The cam lever and the dies, in combination with the lever, the loose pin, and the clamp, constructed in the manner specified.

69. Umbrellas; L. K. Selden, Haddam, Connecticut.

Claim—An umbrella or parasol, having its frame constructed of a rim and stretcher, formed of arms or bars, pivoted and connected together in connexion with the tube, E, and rod, F, arranged as described.

70. Rubber-head for Lead Pencils; W. W. Shaw, Troy, New York.

Claim—A head for lead pencils madé of rubber, in the manner described.

71. Breech-loading Fire Arm; T. E. Shull, Millersburgh, Pennsylvania.

Claim—1st, The combination with a fire arm constructed with a stationary and closed breech or breech piece, and with an opening in the barrel to receive the cartridge, of a hinged flap door or lid which opens and closes the cartridge charging aperture. 2d, The combination with a hinged flap door or lid of a sliding collar or sleeve, so that the operation of sliding the collar back will open the flap door or lid, and the operation of moving it forward will close and lock the same, as set forth.

72. Portfolio; H. T. Sisson, Providence, Rhode Island.

Claim—The combination of the barrel, shaft, hooks or teeth, a spring or springs, spring latch, and stop, constructed as set forth.

73. Side-wheel Steamers; A. M. Sprague, Mobile, Alabama.

Claim—Raising the after guards next adjacent to the wheel about the deck and hull of the boat, and also above the forward guard, so as to leave a clear water-way beneath the after guard and immediately abaft of the wheel, for the purposes set forth.

74. Harvesters; W. S. Stetson. Baltimore, Maryland.

Claim—Giving to the frame a back and forth motion upon the axle-tree, said frame supporting at its rear end the axis of the driving pinion, in the manner set forth. Also, the vibrating frame, connected with the rear end of the frame, and having its céntre of motion coincident with the axis of pinion. Also, the combination of the shoe with the vibrating frame, by means of the hinge bolt, arranged and attached to the rear of said frame, in the manner set forth, by which combination the knife-bar is made self-adjustable. Also, connecting the adjusting lever with the platform and sliding frame, as set forth. Also, horsing the knife over the platform or in a position at right angles, or nearly so, to the axle by the two movements, substantially as deecribed.

75. Syrup-charging Apparatus; W. C. Turner, St. Louis, Missouri.

Claim—The construction of a machine, so arranged that a uniform and definite measure of any liquid may be supplied to a bottle, or any other vessel, before, during, or after filling the same with soda, mineral, or water surcharged with carbonic acid gas, or other gas, or any other liquid, by means of a pump air vessel, safety valve, charging valve, or charger, constructed and applied substantially as described.

76. Cooking Ranges; H. K. Stimpson, Boston, Massachusetts.

Claim—The combination of the flanches or projections attached to the side plates of the boiler chambers with the grate, constructed so as to admit air to the fuel from below, and hung so as to allow of its free play, and made narrower than the fire chamber, whereby the contraction and expansion of the grate is prevented from injuriously affecting the remaining portion of the range or stove. Also, the use of the sliding covers, in combination with the top plate, arranged as described.

77. Manufacture of Resin Soap; Stephen Strung, Birmingham, Pennsylvania.

Claim—The admixture, compounding, and preparing of the ingredients named, in proportions specified and for the purposes set forth.

78. Machine for Dressing Mill-stones; Samuel Teague, Newton, Ohio.

Claim—The adjustable braces when combined with the picks, sliding frame, and levers, constructed in the manner set forth.

79. Manufacture of Iron; Alfred Thomas, Howard Iron Works, Pennsylvania.

Claim—The mixing of charcoal and anthracite metal and forge cinder, in the proportion substantially as stated, and working them together in the puddling or boiling process, or in a refinery fire, for the purpose of making a superior quality of iron.

80. Bedstead; Pelatiah Thompson, Springfield, Ohio.

Claim—The combination of the double series of helical springs with the removable holder strips and series of cross slats operating with their steadying pins. Also, in combination with the series of slats operating with a series of springs, as specified, and the removable holder strip, I claim the series of guiding blocks, when two or more are extended down to prevent the removable strips from jumping.

81. Machine for Jointing Staves; Jonathan Troop, Saintclairville, New York.

Claim—1st, The vibrating frame, F, provided with the clamp bars, h h, and stave-adjusting bars, m, and used in connexion with the gauge-screws, a′, arranged for the purpose of properly presenting the staves to the cutters. 2d, The combination of the above named parts with the rotating cutter wheel arranged for joint operation, as set forth.

82. Machine for Cutting Soles for Boots and Shoes; Albert Warren, Jefferson, Ohio.

Claim—A series of pieces covering the bottom of the box, like c c, separated by a straight line through the centre, together with the series of pieces, like B C, with the knife held securely between their crooked edges, and arranged alternately with a toe to the right and left, and covered by the forms, in the manner described, when these devices are combined with the slide, arranged as specified.

83. Egg Pan; Nathaniel Waterman, Boston, Massachusetts.

Claim—The baking pan or arrangement of cups, and a handle at each end of the series, all connected together and cast or founded in one solid piece of metal and with heat passages between the cups.

84. Fastening Iron Bands on Cotton Bales; C. G. Wells, Galveston, Texas.

Claim—The application of the washer, and the mode of fastening the end of the band with it, and thus expediting the operation of baling and compressing bales of cotton or merchandize, and retaining them securely in their compressed form.

85. Valve Motion of Oscillating Steam Engines; G. D. West, Brandywine Hundred, Delaware, Assignor to P. W. J. Neifus, City of New York.

Claim—The combination of arch and lever, for the purpose as set forth.

86. Burnishing Machine; L. S. White, Waterbury, Connecticut.

Claim—1st, So applying two burnishers in a burnishing machine, that they shall operate simultaneously, at opposite points on opposite sides of the article or piece of work to be burnished, and burnish both sides at once; and that during such operation each shall serve to support the article or piece of work, against the pressure of the other. 2d, The combination of the reciprocating and partially rotating shaft and yoke, or their equivalent, and the tool stock, by means of the rods, s s, the arm, k, and rod, l, and arm, m. 3d, The sliding bars, applied in combination with the tool stock carriage, to operate as specified.

87. Variable Cut-off for Steam Engines; D. A. Woodbury, Rochester, New York.

Claim—The combination of the vibrating yoke attached to the valve stem, and the rotary cam or wiper wheel having arc-formed tappets or wipers, the whole being applied as set forth.

88. Method of Sawing Shingles from the Bolt; Wm. H. and George Yates, Chittenango, New York.

Claim—The adjustable bar and the carriage provided with the adjustable dog, connected with the hand lever, arranged as set forth.

89. Steam Engine; James Black, Philadelphia, Pennsylvania, Assignor to George M. and Wm. S. Worl, and said George M. Worl, Assignor to W. S. Worl, aforesaid.

Claim—The arrangement of the cylinder, hoops, and discs or wheels, when said discs are set eccentrically to an axle which pierces the cylinder transversely, and one end of the piston rod of the cylinder is connected with and operates the hoops.

90. Trace Fastening; Anthony Zink, Lancaster, Ohio.

Claim—The metal ferrule provided with a circular groove running in path of a vertical circle, and two slots running at right-angles to the groove, and a metal cap having two lugs on its inner circumference, with a space existing between them and its head, and a plate extending from the circumference of the head some distance into the side of the trace, as set forth.

91. Bedstead Fastening; Levi W. Buxton, Assignor to Josephus Baldwin and L. Kimball, Nashua, N. H.

Claim—The combination of the shoulders on the locking or rail piece, with the notched or serrated circular edges and conical pin. Also, the combination of the hook with the tube or friction roller and stationary pin.

92. Carpet Sweeper; Jacob Edson, Assignor to self and H. F. Gardner, Boston, Massachusetts.

Claim—1st, Holding the rubber tire upon the driving wheel by means of the groove formed in the said wheel, whereby I am enabled to use a cheaper form of soft or elastic tire than would otherwise be possible. 2d, The use of the flap or float, arranged for preventing the escape of dust and the wear of the brooms. 3d, Arranging two sets of brooms on their common shaft in such a manner that they shall cross each other diagonally. 4th, Holding the brooms upon their shaft by sectional adjustable clamps that reach by or overlap each other, whereby, while every portion of the brooms is securely held, they can be adjusted at pleasure or new ones inserted. 5th, Hanging the broom shaft in such a manner by means of the hinge or pivot joint and yielding spring, that the brooms will adapt themselves to any and all inequalities of the surface to be swept, and at the same time perform their work thoroughly.

93. Washing Machine; Wm. C. Grimes, Assignor to self and R. B. Fitts, Philadelphia, Pennsylvania.

Claim—The combined arrangement of the two parallel rock shafts, having the wash-boards attached thereto respectively, and connected together by the flexible apron, in combination with the double curved bottom of the box.

94. Portable Steam Generator; Wm. C. Grimes, Assignor to self and R. B. Fitts, Philadelphia, Penna.

Claim—1st, Making the three distinctively specified parts, consisting of the furnace, the boiler, with its external cylinder and float attached, and the reservoir, so as to be readily separated from each other, and re-adjustable together at any moment, in the manner and for the purpose set forth. 2d, Making the boiler self-supplying (with water), by means of the float and its containing cylinder, arranged in connexion with the boiler, as described, the same operating together in combination with the reservoir, as set forth. 3d, Making the furnace with an annular chamber between the fire cylinder, the outside shell, and the rings, when the same are constructed, arranged, and combined together, and with the other parts of the boiler, so as to cause the air which supports the combustion of the fuel in the said cylinder to pass down through the said annular chamber, before it enters the said fire cylinder, as described.

95. Pyrotechnic Night Signals; G. A. Lilliendahl, City of New York, Assignor to Martha J. Costan, Washington City, D. C.

Claim—1st, Enclosing the necessary charges of pyrotechnic composition for producing signal fires within cases whose sides are composed of thin paper and tin-foil. 2d, Separating the respective layers of composition in the above mentioned cases, by means of thin partitions or discs. 3d, Charging the aforesaid cases with

such proportions of combustible and non-combustible materials as will allow the cases to be all made of the same length, and also enable a socket to be formed at the lower end of each of said cases. 4th. So proportioning the paper and tin-foil portions of the aforesaid cases, that a sufficient portion of the tin-foil will project above the stiff sides of each of said cases, to form, when bent inwards, a metallic covering for the top of the same.

96. Steam Pressure Gauge; James H. Mosher, Assignor to self and Anson T. Colt, City of New York.

Claim—So applying the valves, in combination with each other, that the gauge may be charged while both legs are open to the atmosphere, and that the air above the mercury in the index tube may be caused to have an ordinary atmospheric pressure while the mercury is at zero, and there is only the pressure of the atmosphere on the back leg.

97. Gauging Device Attached to Hand Saws; Wm. McNiece, Assignor to Walter Cresson, Conshohocken, Pennsylvania.

Claim—The back saw with the folding or adjustable blade fitted in its rib or back bar, as described.

98. Mode of Attaching Straps to Boot Legs, Julius A. Pickering, Assignor to William Walker, Milford, Massachusetts.

Claim—Supporting or retaining the loop or upper part of the strap, in the manner described.

99. Faucets; George W. Randall, Assignor to self and Reuben J. Todd, Boston, Massachusetts.

Claim—The combination of the auxiliary or inner tap with the outer tap and the conduit case, provided with two or more conduits, as described. Also, the arrangement of the air passage, so as to discharge with reference to the discharging end of the inner tap, as described.

100. Ship-steering Apparatus; D. J. Wilcoxson, Milan, Assignor to self and Isaac Collins, Huron, Ohio.

Claim—1st, The combination of the double yoke with the traversing nuts, arranged as described. 2d, Arranging the screws by which the rudder is turned on either side and below the top of the rudder post, so that, in case of accident, the tiller may be used to steer the vessel without its being interfered with by the steering mechanism.

101. Hub Borer; Cutting B. Wiley, Adrian, Assignor to self and Alex. Stebbins, Lenawee Co., Michigan.

Claim—The combination of the sliding cutter head with the adjustable ways or slides, with the nut and screw, as described.

102. Pyrotechnic Night Signals; Martha J. Costan, Washington City, D. C., Administratrix of the estate of B. Franklin Costan, deceased.

Claim—The signalizing of any numeral, combination of numerals, or any character, or any combination of characters, by a methodical exhibition of different pyrotechnic fires, substantially as set forth.

APRIL 12.

103. Machine for Noting the Sums of Numbers Added; J. W. Arndt, Green Bay, Wisconsin.

Claim—The arrangement of three indexes on a dial marked with units, hundreds, and thousands, in combination with the swivel arm, the ratchet wheel, and with the pinions, and with the gear wheels, or their equivalents.

104. Projectiles for Fire Arms; Wm. H. Arnold, Washington City, D. C.

Claim—Combining with hollow base projectiles, a shaft split at its extremity, and otherwise constructed as described.

105. Gauging Threads; J. E. Atwood, Mansfield Centre, Connecticut.

Claim—A series of rollers, or other equivalent devices, so arranged that their surfaces combine to constitute a number of gauges through which the thread is conveyed, by suitable means, and by which its thickness is measured at two or more points at the same time, and a multiplied measurement is obtained.

[The object of this invention is to determine the size or thickness of threads, or of the several portions of a single thread, with a view to their being sorted according to their size, more especially for the sorting of silk thread preparatory to its being manufactured into sewing silk by the doubling, or trebling, and twisting process.

106. Gas Regulators; S. D. Baldwin, Milwaukie, Wisconsin.

Claim—1st, The annular recess or chamber, for the purpose stated. 2d, And in combination with a regulator having such recess, the union piece, as set forth.

107. Shutter Operator; J. K. Barker, Lawrence, Massachusetts.

Claim—The use of the block or arc of convenient size to be fastened to the blind or building, as described. Also, arranging the pipes or cords, and opening, shutting, and fastening exterior blinds in the inside of buildings, by means described.

108. Dovetail Joints for Wood, &c.; F. S. Barnard, City of New York.

Claim—The tongued and grooved sectional dovetail joint to connect wood or other material together, in substantially the manner specified.

109. Stereoscope Case; Alex. Beckers, City of New York.

Claim—1st, The picture frames, constructed of elastic wire, or of any other suitable substance, and provided with a hook for adjusting the pictures in the centre. 2d, The arms, arranged in such relation to the pictures, that by the motion of the arms each of the pictures, when brought before the eye-glasses, can be moved to and from the same, until it comes into the proper focus.

110. Pump; A. Beeler and J. B. Christian, Mount Carroll, Illinois.

Claim—The combination of two sliding cylinders with each other and with a third stationary cylinder, arranged in the manner specified.

111. Self-priming Gun Lock; F. Bell, Washington City, D. C.

Claim—The combination of mechanical devices, as described, with the slide, by means of which the latter can be either kept rigidly in position over the mouth of the magazine chamber, thus intercepting all communication with the latter, or be thrown in gear with the lock plate, so that by cocking the hammer it will be

operated in such manner as to force a cap from the magazine chamber into the discharge chamber of the hammer, on the descent of the latter upon the nipple.

112. Grain Separator; Jacob Benner, Alleghany, Pennsylvania.

Claim—1st, The arrangement of the receiving chamber, separating chamber, collecting chamber, and gathering chamber, when used in connexion with the suction fan. 2d, The arrangement of the shutes and valves, when used in connexion with the conical or convex bottom of the collecting chamber.

113. Smut Machines; Jacob Benner, Alleghany, Pennsylvania.

Claim—1st, The use of plate, with the cone and the opening between the lattice work and plate, when used in connexion with the suction fan, the beaters on drum, and the flues, as described. 2d, The arrangement of the chambers, A B C and L, and the flues, in combination with suction fan, lattice work, opening, plate with cone, and beaters on drum, as described. 3d, The use of the straight or perpendicular part, X, with cap of the casing of chamber, A, for the purpose of forming an eddy in chamber, L, as described.

114. Bread Cutter; Hiram Berdan, City of New York.

Claim—The arrangement of the adjustable cavities, in combination with the cutting-off knife, and the large cylinder and piston, and the so connecting the several parts, that the amount of dough displaced by the piston shall be exactly equal to the cubic contents of the cavities presented for filling between each stroke of the cutting-off knife. Also, the devices for rounding up the loaves as they fall from the cavities, consisting of the grooved roller and shield, the roller having a vibratory motion, in the manner specified, in combination with the preceding arrangement of devices claimed.

115. Attaching Thills to Vehicles; Douglas Bly, Rochester, New York.

Claim—The arrangement of the movable piece or block having the notch and screw shank in half, and slightly wedge-shaped, in combination with the oblique shoulder on the notched screw shank, and with the hook of the block, in the manner set forth.

116. Device for Drawing Sawdust, &c., from Stave Machines; Michael Brayer, Rochester, New York.

Claim—The employment or use of the levers, in combination with the inclined bed, arranged as set forth.

117. Fastening for Shirt Studs; Barnes Clayton, Philadelphia, Pennsylvania.

Claim—The armed post, in combination with the cross-piece fixed to the stem of the front piece.

118. Harvesters; Levi H. Colburn, Baltimore, Maryland.

Claim—The spiral-revolving cutter, arranged with a continuous opening through its centre, for the purpose specified.

119. Variable Cut-off for Steam Engines; J. M. Colman, Milwaukie, Wisconsin.

Claim—Combining the double-seated, balanced, or equilibrium valve with the ordinary slide valve of steam engines, as set forth.

120. Cotton Seed Planters; J. P. Crutcher, Silver Spring, Tennessee.

Claim—The rotating hollow chamber, in combination with the clearer and agitator, and swinging frame, as set forth.

121. Hernial Trusses; Josiah Danforth, Middletown, Connecticut.

Claim—Uniting by a screw or rivet the two springs, at a given point from the end of each, with pads attached, which can be adjusted to the body without any additional spring, and thereby making the arrangement and combination of the two springs, with their respective pads, a truss of itself.

122. Churn; Edward L. Dorsey, Green Wood, Indiana.

Claim—The employment of the trundle wheel, staff, pitman, and cog-wheel, for the purpose of giving at the same time a vertical and a circular motion to the dashers for churning butter.

123. Guide Attachment for Vehicles; Nathaniel Drake, Newton, New Jersey.

Claim—The slotted pole strap bar and catch, placed on and connected with the draft pole, in connexion with the cords attached to the catch, passing through the uprights and shieves of the horse collars, and attached to foot levers.

124. Seeding Machines; John B. Duane, Schenectady, New York.

Claim—1st, The arrangement of the vibrating toothed board and agitating bar, connected by the lever, in connexion with the adjustable slide, and perforated bottom, and grooved roller. 2d, The roller when attached to the frame by the bent levers, and connected with the caster wheels through the medium of the bars, arranged as set forth.

125. Artificial Limbs; Richard R. Dutton, Philadelphia, Pennsylvania.

Claim—1st, The use of the hardened cylindrical tube in constructing joints for artificial limbs, substantially as described. 2d, The use of the feather spring, D, when arranged to operate as set forth. 3d, The use of the bolt and pulleys, when arranged for the purpose described. 4th, The use of the spring, G, when so constructed to act substantially as set forth.

126. Oil Cans for Lubricating; Thomas Fields, Media, Pennsylvania.

Claim—Attaching the oil can by means of a clamp to a handle, and using, in connexion therewith, the lever or bar actuated by the cord and slide.

127. Grain Drills; James Ford, Wabash, Indiana.

Claim—The arrangement of the seed-box, E, lever, N, rod, P, slide, S, lever, M, and tilting frame.

128. Covers for Traveling Trunks; Eldridge Foster, Hartford, Connecticut.

Claim—The air-inflated trunk cover, in the manner set forth.

129. Coffee-roasters; Washington L. Gilroy, Philadelphia, Pennsylvania.

Claim—The arrangement of the two sets of the united staying and guiding pieces, B B and B′ B′, on the inner side of the said hollow sphere, each set being placed diametrically opposite to the other, and with their apexes in the direction of the rotary motion of the said sphere, that they may, in succession, operate in combination with the interior spherical curve of the latter, during its rotary motion, to remove the coffee from the middle of the bottom of the said sphere toward the ends thereof. and essentially permit it to fall gradually over the edges of the said staying and guiding pieces into the middle of the bottom again, as specified, thus rendering the said spherical coffee-roaster perfect in its operation, as described.

130. CALLIPERS; Fayette Gould, Huntington, New York.

Claim—In combination with the jaws and graduated bar, the dial plate, and index, the latter being actuated by the pinion and rack.

131. CHAIRS FOR RAILROAD BARS; Henry H. Graham, Paterson, New Jersey.

Claim—The horizontal binder and vertical wedge, in combination with the chair that receives and sustains the ends of the rails, in the manner described.

132. CARPET FASTENER; Marshall Granniss, Waterbury, Connecticut.

Claim—A carpet fastener composed of a plate provided with ears, and a fork or plate having prongs, as described.

133. JOINT-BODIED BUGGIES; Edwin J. Green, Valparaiso, Indiana.

Claim—Connecting the front axle of a carriage to the body by means of a swivel joint, composed of shaft, king-bolt, turning plate, and stationary plate, when the latter is secured directly to the body of the carriage. Also, connecting the front springs to the coupling or reach by means of the shaft, which is welded, or otherwise secured to said springs. Also, in combination with a hinged carriage body, the braces, for the purpose of preventing the rear axle from being thrown angling when the carriage is loaded heavier on one side than on the other.

134. MACHINE FOR THREADING SCREWS; Ira Griggs, Utica, New York, Assignor to the Utica Screw Manufacturing Company.

Claim—1st, So applying the rest and controlling it by a spring, as to provide for its longitudinal movement in, and independently of, the carriage. 2d, Fitting the cutter stock with an eccentric, operated by means substantially as described, to provide for it a movement for tapering the point of the screw, independent of the vibrating movement to feed the cutter, in cutting the other portion of the screw. 3d, And though I do not claim, broadly, a two-pointed cutter, I claim the construction of the cutter with two points, at such a distance apart as to straddle two turns of the thread and the intervening space.

135. MACHINE FOR NICHING HEADS OF SCREWS; Ira Griggs, Utica, New York, Assignor to the Utica Screw Manufacturing Company.

Claim—The arrangement of the holding dies and feeding slider in a carrier, which swings upon the same shaft which carries the cams for operating the said dies and slider, and operates in combination with the notching-saw. Also, the discharging of the notched blanks from the holding dies in a lateral direction, by the introduction of the new blanks into the said dies.

136. MACHINES FOR TAPERING STICKS; H. S. Hall, A. D. Hunt, and C. J. Winchester, Assignors to H. S. Hall, A. D. Hunt, and C. E. Jeffords, Jamestown, New York.

Claim—The rotating cylinder provided with the adjustable bearings and cutter, one or more, when said bearings and cutters are operated through the medium of the plate, bar, with inclined bar attached, and the rack and pinion, in connexion with the springs.

137. ELASTIC POLISHING-WHEEL; Loren Hale, Milford, Massachusetts.

Claim—The hollow elastic ring, operating as set forth.

138. STIRRUPS; Wm. J. Hammersley, Hartford, Connecticut.

Claim—In a saddle stirrup, the employment of the tube, spring, and spindle, for the purpose described.

139. BED-BOTTOM; H. P. Hart, New Woodstock, New York.

Claim—The arrangement of the springs, hooks, and rails or rods, in combination with each other, by which the turns of the hooks are made to form shoulders to support the springs against the pressure of the rods, when these are made to bear directly upon both ends of the springs.

140. PIERS OR BREAKWATERS; Charles T. Harvey, Marquette, Michigan.

Claim—The combination and arrangement of the adjustable bottom-fender or crib with the pier, constructed in the manner specified, the said fender being hinged or so applied to the pier as to be capable of adapting itself to the slope of the bottom in front of the vertical side of the pier, and of protecting the foundation of such pier from the corroding action of currents.

141. HORSE COLLARS; Thomas Harvey, Baltimore, Maryland.

Claim—The arrangement of the parts forming the body of a horse collar, and the construction of an underback, in such form as that the outer edges of the underback, and the face of the collar, and the outer back, are all made perfectly secure by an under seam, and at the same time the under seam is hid from view and wear, as also showing the stitched edge of the outer back in its proper place, all being accomplished previously to the filling of the collar, instead of putting on the outer back after the collar is filled, as in the manner in putting together a case collar.

142. HORSE COLLARS; Thomas Harvey, Baltimore, Maryland.

Claim—The construction and addition of a fancy welt to a welted horse collar, the same being perfectly adapted to its location, being alongside of the usual welt, and so formed as to bring it directly down on the face of the collar, and thus showing a stitched edge, as also being in the proper place to prevent the hame-tug from cutting into the collar.

143. SEWING MACHINES; Wm. Cleveland Hicks, Boston, Massachusetts.

Claim—1st, Transmitting the motion to the needle-stock from that cam or crank on the main shaft which drives the said stock, by means of a pinion interposed between the connecting rod and the needle-stock, and combining the two by rack-teeth cut on each, and meshing into said pinion, whereby I am enabled to impart to the needle-stock the precise motions of said cam or crank. 2d, Setting the feed-wheel or other feeding mechanism, and the shuttle-race, in such position beneath the sewing-table, that the direction in which the materials will be fed and sewed shall be in a line parallel with the bracket arm, and toward or into the bight formed by said arm and the table. 3d, The apparatus for giving out and taking up the slack of the thread, consisting of a partially revolving crank or arm, placed and operated as set forth.

144. ROTARY HARROWS; W. Y. Hildrup, Harrisburgh, Pennsylvania.

Claim—The arrangement of the bars, sliding piece, braces, and draft bar, for the purpose of giving two or more harrows a self-adjusting movement to or from each other.

145. LAMPS; Samuel A. Hill and David Alter, Freeport, Pennsylvania.

Claim—The arrangement and combination of the strip within the cap, as described.

[By this device combustion is retarded, and the fluid within the lamp, as it is converted into vapor by the

heat, is not instantly burned, but is allowed to absorb or become mixed with a requisite degree of oxygen to support combustion, and give a bright illuminating flame without a chimney.]

146. PLOUGHS; Wm. C. Holmes, Barnesville, Georgia.

Claim—The arrangement of the double beams, hook, cross adjustable braces, shanks, and braces. Also, in combination with the above, the seed dropper, constructed for operation conjointly, as set forth.

147. STOVE COVERS; Isaac G. Johnson, Spuyten Duyvel, New York.

Claim—The centre-piece, constructed of malleable cast iron, as specified.

148. KNAPSACKS; Wm. B. Johns, United States Army.

Claim—The construction of knapsacks, so as to be entirely separated from their slings, and with the means of uniting several of them together, and with stitching them, as described, so that the knapsack will perform the double function of sheltering the soldier and holding his kit.

149. BURNERS FOR VAPOR LAMPS; Henry Johnson, Washington City, D. C.

Claim—The generator, burner, and packing-box, constructed in combination with gas pipe and fluid pipe, arranged as described.

150. MACHINES FOR CHAMFERING SOLES OF BOOTS AND SHOES; Wm. Johnson, Hampstead, New Hampshire.

Claim—The chamfering tool with its sole rest and presser, arranged with respect to the carrier and the knife-holder, as specified.

151. MORTISING MACHINE; Wm. Kegg, Lassellsville, New York.

Claim—The method of feeding along the work, consisting, essentially, of the feeding wedge or wedges, combined with the arms or projections, sliding bolts, and adjustable cams, and arranged with the feeding table, frame, and sliding frame. Also, the adjustable stops and notches in the wedges, with their suspending hooks or staples, arranged in combination with the feeding apparatus. Also, the combination of the double scale, on the face of the feeding table, with the movable or adjustable pointer in the bed-piece. Also, the supporting index standard, in combination with the scale and arrangement for adjusting the bed-piece of the feeding table in position and securing it in place. Also, the "key-tenon," fitting into the oblique groove in the bottom of the feeding table, for the purpose of properly securing and tightening the said table on the bed-piece, while at the same time the desired freedom of its motion is allowed.

152. STOVES; Gilbert J. Kingsbury, Rochester, New York.

Claim—Constructing the fire-pot or furnace so that a portion thereof is flaring or funnel-shaped, yet having side-grates or bars, with perpendicular faces and flame passages, with air tubes, and jets, and grate-cap, when combined with the interior feeding cylinder.

153. DEVICE FOR HEATING FEED-WATER OF STEAM BOILERS; Samuel Lamon and W. S. Gaskill, Vanwert, Ohio.

Claim—The cylinder, or other suitable vessel, provided with the induction and eduction exhaust steam pipes, and the spiral or helical feed-water passages.

154. STEAM GENERATORS; A. B. Latta, Cincinnati, Ohio.

Claim—The method of regulating the circulation of water through the division coils by means of a dividing piece, constructed as set forth.

155. SELF-PRIMING GUN; Richard S. Lawrence, Hartford, Connecticut.

Claim—1st, The "shut-off," constructed as specified. 2d, Constructing the driver with its rear portion of about double the thickness of the pellets, and with the wedge-like bevel and the groove, as described. 3d, The combination of the downwardly extended tooth of the cover spring, and the notches in the shut-off, and in the lock-plate, as set forth.

156. ALARM LOCK; Henry Lockwood, City of New York.

Claim—1st, The bar, provided with the buttons, connected with the hammer-rod, and arranged with the latch and belt, provided with projections, as set forth. 2d, The movable or adjustable plate or disk, arranged with the key-holes, and provided with projections to act on the button of the bar. 3d, The combination of the plates or disk and bar, when arranged with the latch and bolt, as described.

[The latch and bolt of the lock are connected with the hammers of a bell, so that an alarm will be sounded if either latch or bolt are operated, and there is another device which rings the bell when the key is applied to the lock.]

157. RAILROAD CAR SEAT AND COUCH; Wm. R. Jackson, Baltimore, Maryland.

Claim—The method of constructing the ordinary reversible seats of railroad cars, so that the backs can be brought down into line with the bottoms; but this I only claim, when the backs, when so brought down, occupy the positions previously occupied by the bottoms, and the bottoms are used to fill the intermediate spaces between them.

158. HARVESTERS; Gilderoy Lord, Watertown, New York.

Claim—1st, The rake-head, constructed in combination with the endless belt and tripping foot or hand lever. 2d, The combination of the ledge with the spring catch of the rake-head, arranged as set forth.

159. STEAM BOILERS; Edward Lynch, Washington City, D. C.

Claim—Circulating the water and aiding the generating of steam in the main boilers of ocean steamers, by passing the steam from the steam space of an auxiliary boiler into the water of the water space, below the ash-pit of the main boilers.

160. STEAM ENGINES; Edward Lynch, Washington City, D. C.

Claim—1st, The arrangement of the several parts of the engine in their relation to each other and to the propeller shaft, as set forth. 2d, Constructing the connecting rod of one of the cranks or cross-heads, in the manner described, so as to allow of its surrounding the propeller shaft.

161. FOLDING LIFE-BOAT; Henry Martin, Louisville, Kentucky.

Claim—The arrangement of the ribs, one-half of which folds towards one, and the other half towards the other side, in combination with the hinged bottom-boards, which, by means of slots, secure the ribs in an upright position, and are provided with seats hinged to the bottom-boards by means of rods, and connected by the dovetailed projections.

162. CARPET-BAGS; Jonathan M. Mathews, City of New York.

Claim—The combination of the two frames with the catches, as specified.

163. Metallic Lath; Joseph W. Mauterstock, City of New York.

Claim—A metallic lathing composed of plates provided with slits, ridges, and furrows, as described.

164. Screw Propeller; James Montgomery, Baltimore, Maryland.

Claim—A screw propeller composed of a plurality of blades attached to their shaft in one frame, or nearly so, when surrounded by a containing cylinder firmly attached to the peripheries of the said blades.

165. Machine for Corrugating Metal Plates; Richard Montgomery, City of New York.

Claim—1st, Feeding the sheets or plates of metal at the proper time by a feeding device, as described. 2d, The feeding device, in combination with the adjusting pins on the first set of corrugating rolls. 3d, The combination of two sets of corrugating side guides, constructed as described. 4th, The corrugated sweeping and forming roll, constructed as described.

166. Attaching Iron Roofing; T. W. H. Mosely, Cincinnati, Ohio.

Claim—1st, Securing the metallic roofing to the ribs or purlins, so that it may slide or move freely upon and in the direction of the length of the purlins. 2d, Securing the purlins to the rafters of the building, so that they may have freedom of motion in the direction of their length. 3d, The combination of the chairs, double flanched rail, anchors, and metallic roofing, as set forth.

167. Reed Musical Instruments; E. P. Needham, City of New York.

Claim—1st, Applying and arranging two or more actions, one above another, above the rear portion of the key-board of a harmonium, or other reed instrument, in such a manner that one or more of such actions may be removed at any time, and any one be exposed for repair or other purpose. 2d, In combination with the so arranged actions, the passages, e e, and upright passage, f, arranged to combine the said actions with the bellows. 3d, Combining the several valves, or two or more of them, with the key, by a system of push pins, or other equivalent direct connexion from one valve to another. 4th, The sound-board, applied to constitute the back of the wind passage.

168. Spark Arresters; J. F. Page, Philadelphia, Pennsylvania.

Claim—The intermediate casing, with its openings and deflecting plates, when arranged in respect to the chimney, the deflector, and outer casing, as set forth.

169. Coffee Pots; J. B. Parish, Cleveland, Ohio.

Claim—The fluid valve cover, as arranged with the cup and the helical condensing tube, in the manner set forth.

170. Wardrobe Bed; F. C. Payne and A. Reid, City of New York.

Claim—The combined arrangement with a secretary or wardrobe of a bed in the back thereof, in the manner described. Also, the arrangement of the brackets and board, for the twofold purpose of folding compactly to hold the clothes in place, the folding legs, the pulleys, the cord, and weight, as described.

171. Water Cooler; A. H. Phelps, Trenton, Michigan.

Claim—The arrangement or combination of the tank, the refrigerator, and non-conducting chamber or casing. Also, in combination with preceding, the air chamber surrounding the faucet.

172. Treeing Sticks; L. L. Pollard, Worcester, Massachusetts.

Claim—The described treeing stick, when constructed in the manner set forth.

173. Clothes Frame; Robert Ramsay, New Wilmington, Pennsylvania.

Claim—The combination and arrangement of the standard and the arms, with the bolts, washers, and springs.

174. Dirt Scrapers; A. J. Robison, Gypsum, New York.

Claim—The combination of the cam plate with the spring bar for consecutively releasing and retaining the scraper in position, as shown.

175. Mode of Applying Power for Extracting Stumps and Raising Heavy Weights; Henry Rieman, Jr., Rogersville, Indiana.

Claim—1st, The combination with the worm shaft and spur-wheel, the arrangement and application of the movable pillow block and wedge to hold the said spur-wheel firmly in position, or admit of its being readily thrown out of gear. 2d, The adjustable supports, adapted, in the manner set forth, to sustain the machine on wheels, to convey it from place to place, and permittting its deposit on the ground while in operation.

176. Mole Plough; D. F. Robbins and Simeon Morrison, DeWitt, Illinois.

Claim—Making the beam of a mole plough in two parts, united by a horizontal joint to give it lateral adjustment. Also, connecting the drag (which supports, and upon which the point of the beam is made adjustable, vertically,) to the rear portion of the beam by a hinged joint or connexion, so that the raising or lowering of the point of the plough beam shall not affect the drag.

177. Water Wheels; J. S. Rowell, DeW. C. Teller, and M. Lowth, Beaver Dam, Wisconsin.

Claim—1st, The combination of a series of curved guides with the buckets of a water wheel, in the manner specified. 2d, Having the guides curved and fitted to a hub of a wheel, and arranged on a rising and falling governor or spring and regulated capping plate, so as to overhang the buckets and extend down, more or less, over the discharge orifices of the same.

178. Oscillating Engine; Mark Runkel, City of New York.

Claim—The segment with the projections, in combination with the shell and the abutment, or its equivalent, arranged as specified.

[The steam in this engine is admitted alternately to each side of an oscillating piston, which works in a shell similar to a rotary engine, the change of the direction of the steam being effected by a slide valve. The oscillatory motion of the piston being converted into rotary by mechanical means.]

179. Harvesters; Hiram H. Scoville, Syracuse, New York.

Claim—The arrangement of the propelling crank and stationary cam, with respect to the rake bar and universal joint. Also, suspending a swinging apron from the frame work over the platform and in front of the rake.

180. Machine for Splitting Shoe-pegs from the Block; Winthrop D. Shaw, Tamworth, New Hampshire.

Claim—The feed roller in connexion with the two reciprocating or vibrating knives, the latter being so

operated that one will move slightly in advance of the other, so that the cuts will be given the block successively, and still admit of the proper feeding of the block to the knives—the feed roller being operated by the pawl, rendered adjustable by the attachment of the bent lever to the adjustable bar.

181. SKATES; D. H. Shirley, Boston, Massachusetts.

Claim—A sliding heel-piece or clamp, susceptible of being moved forward and back, and fastened at any desired point, in such a manner that the toe of the boot or shoe, being held by a suitable toe-piece or longitudinal binding force, can be brought to bear upon or relieved from the foot.

182. METALLIC COFFINS; Isaac C. Shuler, Amsterdam, New York.

Claim—1st, The arrangement of fastening the flanch or lower ends of the walls of a sheet metal coffin in a tray or pan, which forms the bottom, and which exceeds the circumference of the walls, by a narrow chamber which may be filled with molten metal for stiffening the base; also, the strengthening bars for stiffening the bottom of the tray. 2d, The arrangement of scrolling or doubling over the flush lower edges of the walls of a sheet metal coffin, soldering consecutively each fold of the sheet metal, thus making a solid rim or flanch of any required thickness, for the purpose of strengthening the base. 3d, The arrangement of placing on the outside of the walls, even with the upper edge, and extending downward any required distance, according to the size of the coffin, a sheet metal rim which may be filled with the molten metal, for the purpose of strengthening and keeping in shape the upper edges of the walls of a sheet metal coffin. 4th, I disclaim an entire frame for covering the joint of the air-tight lid of a sheet metal coffin, with the coffin walls; I also disclaim any bisected sliding cover, these being claimed elsewhere—but I claim the hinged lids as applied to the joint in different sections, for the purpose of allowing a greater number of ornamental breaks in the coffin walls. 5th, The frame for the support of the coffin handles.

183. FASTENING FOR SHIRT-STUDS; Henry Simon, Providence, Rhode Island.

Claim—Shirt-studs, arranged to operate in the manner specified.

184. HARVESTERS; John Smalley, Bound Brook, New Jersey.

Claim—1st, The combination of the seats, one of which is movable, with the seat frame, elliptical springs, and main frame of the machine. 2d, Constructing the outer piece in the peculiar manner described, viz: with two or more sockets, in combination with the caster-supporting hub and extension piece. 3d, The neck, in combination with collars, groove, standard, and lever, arranged for the purpose of throwing the gearing in and out of action. 4th, Supporting the reel arms by means of the peculiarly constructed hub.

185. COCKS FOR WATER BASINS; Horace W. Smith, Hartford, Connecticut.

Claim—The employment of the spring and the grooved and bevel face cam, when acting in combination.

186. EPAULETTES; James S. Smith, City of New York.

Claim—The arrangement and combination of the adjuster, fringe, and shell, as described.

187. GRATES; Philip Smith, Fall River, Massachusetts.

Claim—Hanging the front plate on pivots arranged so far below the top that, when the bottom is swung out, it will carry in its top and operate the inner upper plate, L. Also, arranging the plate, L, to vibrate. Also, the plates, H and H′, constructed as described. Also, making the plate, L, in separate pieces, fitted together in the manner described.

188. STOVES; Philo P. Stewart, Troy, New York.

Claim—The method of preventing the heat from striking through to the rising flue leading to the chimney, by separating it from the back oven plate, and from the two descending flues, by non-conducting partitions, or the equivalent thereof. Also, in combination with the flue above the oven, and with the rising flue leading to the chimney, the employment of a double-damper filled in with cement, or other equivalent non-conducting material, to prevent the heat from striking through from the top flue to the rising flue. Also, separating the direct flue under the oven from the return flue below by means of a plate lined with cement, or rendered non-conducting by equivalent means, to prevent the heat from striking through to the return flue, and thereby impart greater heat to the bottom of the oven.

189. TOOLS FOR FORMING LUGS IN THE MOUTHS OF BOTTLES AND JARS; Amasa Stone, Philadelphia, Penna.

Claim—Making one part of the spindle, which forms the orifice of the jug or bottle, to turn freely, while the other part remains stationary in the nose of the bottle. Also, making one, two, or more scores in that part of the spindle that turns freely, in combination with the corresponding score or scores in that part of the spindle which is stationary, and which aid in forming the orifice in the jug or bottle nose.

190. STOVES; David Stuart, Philadelphia, Pennsylvania.

Claim—The distributing chamber or discharge pipe, r, formed with a central projection, and supplied with heated air from the grate front through pipes, h. Also, the discharge pipe, z, located under the oven, and supplied from the grate front by pipes, k. Also, dividing the grate front horizontally into two series of heating chambers.

191. COVER LIFTERS IN COOKING STOVES; Philo P. Stewart, Troy, New York.

Claim—The lifter, made up of malleable cast iron and wood.

192. CONSTRUCTION OF NAVIGABLE VESSELS; R. H. Tucker, Jr., City of New York; patented in England, December 10, 1857.

Claim—The construction of navigable vessels in the form of isosceles triangles, with vertical sides and flat bottom, the base for that side of the triangular figure which terminates in the two equal angles, constitute the stern, in combination with the air chamber.

193. ROTARY HARROWS; S. M. Wade, Andover, Ohio.

Claim—The bar, K, provided with the arm, M, clutch, and pins, in combination with the angular draw bars and double harrows. Also, the rod, arms, Q, and rollers, in combination with the angular draw bars and double harrows.

194. WATER WHEELS; Paul Wagner, Buffalo, New York.

Claim—The combination of the buckets, D, arranged on the cylinder, E, and the stationary inclined planes or buckets, G, arranged with reference to the cylinder, H, and buckets, D, the whole being enclosed by the case, A.

195. VALVE GEAR FOR STEAM ENGINES; Elijah Ware, South Boston, Massachusetts.

Claim—Combining the eccentric rod with the valve rock shaft, by means of the lever, with its two arc-formed slots and the movable pins. Also, the combination with the double-slotted lever and its movable pins of the levers, Q V, rods, m U, levers, M N and T, secondary lever, O, pinion, u, toothed arc, S, and rods, L P.

196. Seeding Machines; Moses D. Wells, Morgantown, Virginia.

Claim—The notches of the bar with the series of pins therein, in combination with the guides and upward projecting rims of the discharge openings.

197. Quilting Frame; Joseph Wetherill, Manchester, Connecticut.

Claim—The employment of the rolls, C D E, in combination with the arms, pawls, and notches, so that the upper roll, E, may be lifted when desired.

198. Hoop-fastening for Cotton Bales; George J. Widrig, Memphis, Tennessee.

Claim—The combination of the sides having slots or grooves with the bar, for the purpose of fastening cotton bales, or other similar substances, by bringing the last end over the bar.

199. Constructing Electro-plated Rollers; John W. Wilcox, West Roxbury, Massachusetts.

Claim—Covering the shaft, base, or support with a fillet or ribbon of metal, soldered or otherwise secured thereto, and depositing the copper on said surface by electro-plating.

200. Brick Machines; Russell Wildman, Danbury, Connecticut.

Claim—1st, The vibrating arm, when constructed, combined, and operated as described. 2d, The vibrating feed, when constructed, arranged, and operated in combination with the mould.

201. Gates for Canal Locks; C. W. Williams, Port Jervis, New York.

Claim—1st, The rods and rack applied to the gates. 2d, Having the journals of the gates fitted in oblong slots of the pulleys, which are placed in suitable bearings or boxes, and arranged to admit of the sagging of the gates, and the close fitting of the same when closed. 3d, Securing the bearings or boxes to the lock, by means of the rods, the boxes being attached to slides, and arranged so that the boxes may be adjusted as occasion may require. 4th, Operating the wickets by means of the gearing, whereby either wicket may be operated from one and the same crank shaft.

202. Ploughs; Wm. H. Wilson, Summerfield, Ohio.

Claim—The arrangement of the sub-soil shovel, the common shovel, coulter, and brace, constructed as described.

203. Adding Machine; C. Winter, Piqua, Ohio.

Claim—1st, The arrangement of the lever, spring, shaft, wheels, and stops, in the manner set forth. 2d, The arrangement of the ratchet wheel, bevel wheels, pawls, cord, and pulley, in the manner described.

204. Mode of Applying and Constructing Horse Power Machines; Wm. Zeller, Lebanon Co., Penna.

Claim—The construction by which it is made to drive a reaping machine or stationary power, as described.

205. Hanging Bells; Henry Belfield, Assignor to self and Justice Cox, Philadelphia, Pennsylvania.

Claim—1st, The lever, G, its spring dog, and spring, f, in combination with the bell-crank lever, F, its hammer and spring, n, arranged in respect to each other and to the bell, as set forth. 2d, The bracket, with its four legs and projection for holding the bell, the said bracket being arranged in respect to, and in combination with, the levers, G and F, and their respective springs, in the manner specified.

206. Revolving Plugs for Manufacturing Bottles and Jars; John F. Bodine, Assignor to self, Wm. H., and Joel A. Bodine, Williamstown, New Jersey.

Claim—The large ring bearings, formed on and near the circumference of the turning plate, and fitting in ring grooves formed in the plug and capping plate.

207. Machines for Cleaning Grain; Harrison Fitts, Somerset, Assignor to self and Nelson Turrel, Addison, Michigan.

Claim—The combination of the adjustable piece with the concave and rubber, as set forth.

208. Obtaining Fibres from Waste Felted Fabrics; J. F. Greene, Brooklyn, New York, Assignor to S. B. Tobey, Providence, Rhode Island.

Claim—Subjecting the felts to be disintegrated to the successive and combined action of steam and picking, the steam having the effect either to so unfelt or loosen the hold which the fibres have on each other, in felted fabrics, that they can be drawn apart of sufficient length, to be advantageously employed in the manufacture of other felts or other fabrics.

209. Machinery for Disintegrating Waste Felt Fabrics; J. F. Greene, Brooklyn, New York, Assignor to S. B. Tobey, Providence, Rhode Island.

Claim—The combination of the steaming apparatus and the picker for steaming the felt, as it is passed to the picker to be disintegrated.

210. Machines for Cutting Corn Stalks, &c., on Ground Preparatory to Ploughing; Hezekiah Johnston, Assignor to self and Richard Withers, Collinsville, Illinois.

Claim—Arranging and combining the curved frame with the knives and the guides, in the manner described.

211. Machine for Cutting Files; C. Miller and T. W. Decker, Assignors to T. W. Decker, City of New York.

Claim—1st, Arranging the gauge rest to oscillate on a fulcrum located in relation to the cutting chisel, so that by moving the arm of said rest laterally, by means of the screw, the bed and blank may be adjusted to correspond with the cutting edge of the chisel. 2d, Hinging the frame which carries the chisel and its appurtenances to the frame by a joint at f, so that the rest may readily follow the curve of the file blank, and, with the chisel, be thrown back, when desired.

212. Machines for Wringing Clothes; T. H. Peavey, Montville, Assignor to self and C. G. C. Collins, Portland, Maine.

Claim—The arrangement of the rollers, C and D, with the rollers, A and B, when constructed in the manner described.

213. Threshing Machines; John J. Sigler, Assignor to self and W. M. Griffith & Co., Martin's Ferry, Ohio.

Claim—1st, The series of rollers provided with fingers or projections, in combination with the slab device, b b′ b″, the fingers working in the spaces between the slats, and being used for the purpose of carrying the straw from the threshing cylinder to the place of discharge, and at the same time so tossing it as to secure an effectual separation of the grain therefrom, the slab device being employed for the purpose of supporting the body of the straw between the impulses of the fingers, and also for the purpose of preventing the straw from

winding on the rollers. 2d, The application of the oscillatory motion to the fingered shaft, by means of which I secure an agitation inwardly towards the fan, in addition to the throw towards the place of discharge, for the purpose of more effectually freeing the apertures near the tail of the riddle from obstruction, the required motion being obtained by means of the pinion, rack segment, and arm.

214. Method of Arranging Galvanic-electro Helices for Magnetizing the Driving-wheels of Locomotives; Orrin D. Vosmus, Boston, Assignor to self and Edward W. Serrell, Greenfield, Massachusetts.

Claim—A curved helix applied to the wheels of a locomotive engine, in substantially the manner specified, whereby the point of greatest magnetic effect is the point of contact between the wheels and track. And, in combination with the helix aforesaid, I claim adjusting the helix, in the manner and for the purposes specified.

215. Pumps; Benjamin Douglass, for himself and as Administrator of the estate of Wm. Douglass, deceased, Middletown, Connecticut.

Claim—The combination of the lugs within the flanch, and the conical set nut for fastening the lower end of the pump cylinder.

MECHANICS, PHYSICS, AND CHEMISTRY.

*On the Co-efficients of Elasticity and Rupture in Wrought Iron, in relation to the volume of the metallic mass, its metallurgic treatment, and the axial direction of its constituent crystals.** By R. Mallet, M. Inst. C. E.

[Read before the Institution of Civil Engineers, March 1, 1859.]

It was assumed that amidst the numerous theoretical treatises upon, and practical investigations into, the strength and other properties of iron, the two questions which formed the prominent features of the author's present experimental inquiry had remained comparativley untouched. The conditions of manufacture and the resultant qualities had been hitherto too lightly passed over.

Iron was formerly entirely worked under tilt hammers; the process of rolling was then introduced, and now, in consequence of modern engineering requirements, masses of iron of considerable magnitude were produced by faggoting together, under heavy forge hammers, from large numbers either of bars or slabs grouped together. The masses were not however found to possess ultimate strength in proportion to the number of bars of which they were composed; in fact, it appeared that the strength of the mass became less in some proportion as the bulk became greater. This was admitted as a fact, but no one had hitherto attempted to show experimentally—what function of the magnitude was the strength of a given kind of iron manufactured in a given manner; or how the same forged mass, when very large, differed in strength in different directions with reference to its form; or how the mechanical part of the process of manufacture of the same iron affected its actual strength, either as a rolled bar or forged mass.

Addressing himself to this investigation the author dealt generally with three points of the inquiry, viz.—

1°. What difference did the same large bars of unwrought iron afford to forces of tension and of compression when prepared by rolling, or by hammering under a steam hammer?

2°. How much weaker per unit of section, was the iron of very massive hammer forgings than the original iron bars of which the mass was composed?

3°. What was the average or safe measure of strength per unit of

* From the Lond. Civ. Eng. and Arch. Jour., April, 1859.

section, of the iron composing such very massive forgings as compared with the acknowledged mean strength of good British bar iron?

In the investigation of these questions other subordinate but very important points arose: such as the determination of the relative longitudinal and circumferential strength of equal sections of the iron in massive cylindrical forgings.

The proper measure of the strength of iron, or any imperfectly elastic material, was the "work done," whether by extension, compression, rupture or crushing, due to any force applied to it. The co-efficients T*e* and T*r* were designed by Poncelet to express this work done by an extending or compressing force upon any elastic prismatic body at the point where its elasticity became permanently impaired and its form distorted, and at the further point where rupture occurred. The method of arriving at these co-efficients was then given, and it was shown that, though they were not sufficiently attended to in practice, yet that they were the true measures of the safe and ultimate resistance of materials when applied constructively in machines or otherwise.

The crystalline structure of iron was then considered, and quoting from the author's communication to the Royal Irish Academy (*Trans.* vol. 23, p. 1, 1855), it was shown to be a law that "Iron, whether in the state of cast or of wrought iron, has the principal axes of its integrant crystals arranged in the lines of least pressure within the mass."

If consolidation from fusion took place undisturbed, as in cast iron, the principal axes would be arranged in the directions in which the heatwave had passed outwards from the body in cooling; which would be perpendicular to its surface contour,—those being the direction of least pressure of the internal constraining forces, produced by contraction in cooling, which were necessarily parallel to the planes of external contour.

The effects of rolling and of hammering masses of wrought iron of different contents were then treated of, and it was shown that what was termed "fibre" was the longitudinal extension of the principal axes of the crystals. The original development of these crystals under the constraining forces due to change of temperature, &c., was "cæteris paribus" proportioned to the time given for such development. Thus, in very large forgings the crystals were generally extensively developed, in consequence of the length of time which the mass had been under the operations of heating and forging.

It had long been admitted that large forgings became weaker in proportion as their bulk was increased, but as no definite ratio was recognised it became of importance to fix the conditions of strength in wrought iron under various circumstances. The author was enabled to undertake this investigation, under the authority of the Minister of War, and with the concurrence of the Royal Society, when making the forgings for the two 36-inch wrought iron mortars constructed on his design for the Government; he then selected specimens of iron upon which the experiments of tension and compression were tried.

The methods were then explained by which the specimens of iron were obtained from large masses, and the apparatus was described by

which the observations were made, when the specimens were undergoing the operations of extension and compression. In cutting and boring into the massive cylindrical forgings to obtain the pieces of iron from the various parts, it was invariably found that there existed internally large transverse rents, with jagged and crystalline irregular surfaces, the opposite faces of which were counterparts, and presented distinct evidences of having been torn asunder by contraction from the centre towards the circumference as the mass cooled. The *rationale* of the phenomenon appeared to be, that this action was simply due to the contraction of the external shell before the temperature of the centre had been perceptibly lowered; this in its turn was cooled, and in contracting produced these visible rents or fissures, and no doubt caused other minor dislocations, which detracted from the general strength of the mass.

This was evidently the cause of the difficulty of obtaining very large forgings of a cylindrical form quite sound; as if the diameter was sufficiently great all such cylindrical forgings so built in construction, and so treated by heating, hammering, and cooling in manipulation, must become unsound internally by the opening within the mass of one or more of these rents in the direction of the axis during the process of cooling. In solid cylinders, or conic frustra, it must occur whenever the dimensions were such that the total amount of contraction of the metal in any one diameter from its highest temperature down to that of the atmosphere, as fixed by the circumference of rigidity due to the outer cold shell, exceeded the limit of extension of the iron at rupture due to the length of the diameter of the interior core, which cooled last. This was the theoretic limit of size of forging, beyond which internal rents must occur. The practical illustration was, that almost all cylindrical shafts of wrought iron exceeding 12 inches in diameter were found to have one or more of these rents in them, thus having their strength impaired. This reduction of strength was altogether distinct from any deterioration of quality of the metal, arising from its being alternately heated and cooled and hammered.

The remedy for this play of molecular forces was to construct and work the large forgings hollow. This course had been pursued with success at the Mersey Iron works, Liverpool. When a cylinder had a large concentric cylindrical hole along its axis it cooled at the same time, though not equally, on both the internal and external surfaces, and thus the extremes of internal strains were avoided, and the hollow centre yielded more readily to the forcible compressive grasp of the exterior.

A minute description was then given of all the irons which had been experimented upon, specimens of each being exhibited at the meeting. They were divided into classes according to their several characteristics and modes of working, and into the most analogous class was imported Clay's puddled steel, a comparatively new material, which had been brought into this investigation for the purpose of comparison, and the results were such as promised to be of great practical importance. The general results were the separation of several classes into

two grand divsions: 1°. The crystalline, or sub-crystalline in fracture, which were always the result of manufacture by the hammer. 2°. The fibrous or crystallo-fibrous, which were always produced by the rolling process, but which might be produced by careful and continuous elongation under the hammer.

The very weakest wrought iron of all those experimented upon was found to be that cut transversely from the end of a very heavy cylindrical forging which had been exposed to heat and percussion for nearly six weeks. Exposed to tension its elastic resistance was only $3\frac{1}{4}$ tons per square inch, which was less than the average of cast iron; thus, as regarded pressure, it was the very weakest iron produced by any method of manufacture; whilst the faggot bars of which the mass was built and welded up, bore a tension of upwards of 12 tons per square inch before losing their elasticity, and of nearly 23 tons at rupture, and a pressure of nearly $21\frac{1}{2}$ tons before losing elasticity, and of nearly $27\frac{3}{4}$ tons at the point of total distension or crushing: thus proving the fact that the extreme weakness of wrought iron in heavy forging was not due to any metallurgical alteration in the constitution of the metal, but to changes in its state of aggregation, induced by a process of forging, by the long-continued and unequal heating, and by the hammering.

Hence was deduced the conclusion, that practically the iron of very heavy shafts, forged guns, huge cranks, and other similar masses, might be expected to become permanently set and crippled at a trifle above 7 tons per square inch, and to give way by fracture at about 15 tons per square inch by tension, and to completely lose form at pressures of from 15 to 18 tons per square inch. Therefore it followed, that allowing a deduction of one-half, as sanctioned by practice, from the elastic limits of tension and of pressure for the margin of safety, the iron of such forged masses should not be trusted for impulsive strains exceeding about $1\frac{3}{4}$ ton per square inch of tension, and about $4\frac{1}{2}$ tons per square inch of pressure, or for passive tensile-strains of $3\frac{1}{2}$ tons per square inch, or for passive pressure beyond 9 tons per square inch.

Further experiments demonstrated that in heavy rectangular forged slabs of upwards of 12 inches in thickness, in the plane of the slab, the resistance to all the forces was much higher, and hence large cranks which were usually cut out of such rectangular forgings were stronger than the shafts to which they were attached, in the ratio of 8 to 6. The physical cause of the difference in strength between large cylindrical and rectangular forgings, although made from the same original material, was to be found in the difference of the molecular arrangement. The integral crystals of the cylindrical masses were strained, distorted, and partially separated by the effects of hammering in various directions, and by the peculiar constraining forces due to the contraction in cooling; whereas, none of these forces acted to the same extent upon rectangular masses, which were only hammered in three directions, and the constraining forces of cooling were all parallel to the faces of the parallelopiped, or in three directions only.

A special peculiarity noticed in heavy forgings was the sudden and extreme inequalities of texture and of strength found in different and even in closely adjacent portions of the same mass, producing greater uncertainty of result in practice.

Another peculiar feature was that the rates of extension or of compression did not move uniformly, but by fits and starts. This phenomenon obviously arose from the *per saltum* disintegration of planes of crystallization, and their more or less complete separation in a crystallized but yet ductile body. This had never been observed in fibrous irons, or in those in which the finely elongated crystals were all rolled parallel and in the line of the length of the bar or the sheet.

If the original or integrant faggot bars, from which a heavy forging was built and welded up, had a tensile elastic strength of 12 tons per square inch, the forged mass itself would have a mean tensile elastic strength of only 7 tons per square inch; and correspondingly if the faggot bar had a compressive elastic resistance of $2\frac{1}{2}$ tons, the forged mass itself would range under 18 tons per square inch.

Thus, within the limits of practice, the work of passive resistance sustainable by heavy forgings was about one-half that of the faggot iron from which they were manufactured; but at the ultimate point of rupture they gave a better result. Heavy forgings were also more trustworthy when exposed to tensile strains in direction of their length or to transverse strains, as in girders, which ultimately were resolved into longitudinal strains, than when subjected to twisting strains, as in shafts, or to direct pull across the direction of length.

These and other considerations induced attention to the apparently superior power of puddled steel to support the forces by which the ordinary forged masses of wrought iron were fractured, especially as by the employment of smaller and lighter masses greater strength in shafts, &c., could be secured. One special peculiarity appeared to be, that in the heaviest pieces of this material the internal structure was as fine and close in the grain as it was in the smallest bar. The elastic limit was above that of the best wrought iron, and the elasticity was so much more perfect, that it might be trusted almost up to the elastic limit of about 15 tons per square inch, and in forged masses it possessed this strength nearly equally in every direction. The range of extension at the elastic limit was rather greater than that of fibrous hammered bar iron of excellent quality. Beyond the elastic limit, with equal increments of strain, its extension did not rapidly diverge and increase, as in wrought iron; it slowly increased up to about 20 tons per square inch, and gradually and evenly enlarged up to the breaking point, which was not reached within 42 tons per square inch, and was often found to reach 48 tons per square inch.

This puddled steel was not like cast steel, a harsh, rigid, and glassy material, which possessed indeed enormous cohesion, but yet was so rigid and unaccommodating to forces variable in direction and impulsive in character as to deprive it of trustworthiness in practice. On the contrary, puddled steel appeared to combine the great strength of cast steel with ductility and perfect elasticity of the best wrought iron.

Its resistance to pressure was very remarkable, being more than double that of harsh crystalline wrought iron, and more than three times that of the best fibrous wrought iron in bars or plates. Thus it may be safely used under a passive strain or load of 20 tons per square inch, after allowing a margin of one-half for security.

Puddled steel would thus evidently become an important practical adjunct in the construction of machinery, in building vessels of light draft of water, and for artillery of the largest calibre. It possessed also the peculiarity of resisting corrosion much better than wrought iron plates, and thus had an additional value for ship-building.

An investigation was then entered into of the causes of the manifestly greater strength of the integrant slabs than of the large forgings built up from them; but it was shown that this quality did not extend to the boiler plates which acquired a certain amount of rigidity. This was also possessed by the puddled steel, and it was anticipated that it would ultimately be extensively employed for the boilers, and even the fire-boxes of the locomotive boiler.

From this investigation nothing of a certain character could be concluded as to any fixed relation between the strength and the specific gravity of the several sorts of iron experimented upon. The weakest irons—those from the heavy forgings—having generally the highest specific gravities, though always lower than their integrant faggot bars. Thus it appeared that specific gravity was a characteristic to which too great importance had hitherto been attached in relation to strength both in cast and in wrought iron. It was modified, increased, or diminished by the mechanical operations of manufacture to an extent far beyond anything that chemical difference of constitution produced, and in reality it afforded no criterion of strength, although in fibrous irons it did afford an index of their degree of extensibility for equal size.

The modulus of elasticity deducible from these experiments, from the mean results of the great forgings, was 12,559,680 lbs., or 3,771,-675 feet for iron forged in great cylindrical masses. The mean specific gravity being taken at 7663, the weight of 1 foot long by 1 inch square of this iron was 3·33 lbs. The modulus for great forged rectangular masses or slabs was 18,079,200 lbs., or 5,478,545 feet; the specific gravity being 7610, and the weight of a bar 1 foot long and 1 inch square 3·30 lbs. Both fell far below the modulus for good English bar iron of 7,550,000 feet as deduced by Tredgold, or even below 6,787,878 feet as deduced by Edwin Clark from Eaton Hodgkinson's experiments.

The author concluded his paper by recording the obligations he was under to Messrs. Horsfall and to Mr. Clay, of the Mersey Steel Works, Liverpool, and to the officers of the War Department and Royal Arsenal Woolwich, for the facilities afforded to him during his investigation.

*New Paper Materials.** By M. C. Cooke.

One result may fairly be attributed to the offer of a premium, by one of the daily papers, for a new and available paper-stuff, which should supply the deficiency of rags; and that result an important one. It has stimulated many an effort to supply that want not only at home but abroad; and we are now in a much better position to do without rags for our own paper manufacture than at any other period of our history. It may be true that the premium has never been paid, but it is equally true that we are nationally full the thousand pounds richer on account of that offer. Why it has not been paid, forms no part of this inquiry, neither to whom it should have been awarded. Let it suffice to point to some of its results. Out of the numerous efforts to furnish good paper with only a per centage of rags, one of the most successful with which I am acquainted is that of Dr. Collyer, which was patented in 1857. It consists in applying the residue of the beet-root left in the process of sugar-making and distillation to the manufacture of paper, papier mache, millboard, and other paper manufactures. One feature pointed out in the process of this manufacture is, that no sizing is necessary, on account of the nature of the material used. In consequence of the whole mass being permeated, instead of the surface alone being covered, it is, from its compactness, solidity, and elasticity, not liable to crack, and for the same reason will resist damp and moisture when in the form of paper. The patentee states, "The extraordinary tendency which the cellulose, starchy, and proteine substances have to enlarge when exposed to heat and moisture, renders them very valuable for giving strength to other material, especially to cotton, which is deficient in these properties. When thus mixed each fibre of the cotton becomes cylindrical and thick, and attains the strength of hemp and flax, and no longer loses its shape through pressure. A similar improvement is evident when it is combined with other materials. A proportion of 10 per cent. of the prepared residue with the other usual material, makes tougher and more flexible paper. Twenty-five per cent. renders packing paper sufficiently waterproof that it will require no other sizing. Fifty per cent. will produce paper nearly or quite as strong as parchment, and which in very thin sheets will preserve articles packed in it from dampness. Strong paper, cardboard, &c., can be made from 75 per cent. of prepared residue and 25 per cent. of cotton; also of 50 per cent. of prepared residue, 40 per cent. of raw residue, and 10 per cent. of saw-dust, hay, straw, &c. Fifty per cent. of prepared residue and 50 per cent. of fine cut straw will produce strong packing paper, as will also 50 per cent. of white saw-dust, 30 per cent. of prepared residue, and 20 per cent. of cotton rags. A good, strong, white paper for printing purposes has been made with 50 per cent. of beet-root residue and 50 per cent. of cotton, no sizing being required in the process, and the result has been entirely satisfactory, the paper so made being remarkable for its tenacity. It will, however, have

* From the Lond. Jour. of the Society of Arts, No 321.

been observed that something beside the beet-root residue is required to make good paper, and that the best substance for that addition is cotton or cotton rags, the use of which this patent does not supersede."

Another patent, or rather series of patented paper pulps, worthy of notice, are those of Mr. Plunkett, of Dublin,* in all of which the material, *per se*, is capable of furnishing serviceable paper. Patented also in 1857, the entire value and capabilities of the materials have not yet been fully ascertained. Mr. Plunkett's papers are made from four different plants, any one of which furnishes a good paper pulp, and may be obtained in almost unlimited quantities. These are the tree-mallow, red clover, hop bine, and yellow water-iris. To the first of these we may look, perhaps, for the most satisfactory results. The order to which the tree-mallow belongs is composed of eminently fibre-producing plants. Independent of the cottons, we have numerous species of *Hibiscus*, *Sida*, *Abutilon*, *Urena*, and *Thespesia*, yielding useful fibres which leads us to expect, perhaps to find in *Lavatera arborea* a good material for pulp.

"The tree-mallow grows wild on several parts of the south-west coast of Britain, as well as on the east coast of Scotland, on rocky cliffs, flowering in July, and often producing a long succession of bloom. In gardens the plant often remains some years without blossoming, but dies in the winter after it has flowered, being naturally biennial. Seeds scattered in the ground will, some of them, keep springing up every season for an undetermined number of years, but the young plants are impatient of the cold, except in maritime situations, and few of them survive even a single winter. The root is deep and much branched; stem, 6 to 10 feet high, upright, straight, round, simple, except in the upper part, where it forms a branched leafy head. It is clothed with clusters of small deflexed bristles. Leaves alternate on long stalks, pliable and downy, of seven shallow crenate lobes. Flower on simple axillary clustered stalks, very much like those of *Malva sylvestris*. Outer calyx deeply divided into three large lobes, but not as in Malva formed of three separate leaves. A slight or rather artificial distinction."†

On inquiry, I find that the *Lavatera* will, with the addition of saline manure, grow freely on the deepest bog land. My informant states that he has seen it in perfection on the west coast of Donegal, growing where there was very deep bog, at least thirty feet. A gentleman in Londonderry, who is owner of a large tract of slob land, intends cultivating the plant extensively next season, for which purpose he has about 250 acres at disposal. When this experiment shall have been made, we shall be in possession of facts as to the cost of culture and the produce per acre. The plant, if cultivated, would not only yield hemp enough for home use, but also give, from the hacklings, or tow, and the wood, a large supply of paper material. The quality of the hemp obtained from the bark would command for it a ready sale.

* Specimens of these substances were shown at the Society's last Annual Exhibition of Inventions. See Catalogue for 1858, No. 301.—Ed. J. S. A.

† English Botany, or Colored Figures of British Plants. London, 1803.

Cordage has been made from it experimentally, and so satisfied were the company entrusted with the manufacture of the specimens, that they have guaranteed the purchase of any quantity which may be grown on the Londonderry estate next season. The refuse leaves, wood, and tow, would furnish paper pulp.

The process of manufacture of paper from these substances is that ordinarily pursued. The wood has to be reduced to chips or shavings, and whether wood, leaves, or tow, boiled in caustic alkali and bleached in the ordinary manner. The paper thus made presents no external variation from that made of rags.

Specimens of the plant, wood, hemp, cordage, fine thread, and lace, made from this plant, together with paper made from the wood, I shall be happy to show to any one interested in the experiment.

Another substance used by Mr. Plunkett for paper pulp is the common red clover, *Trifolium pratense*, in order to obtain which, the clover is taken, either in its green state or when dried into hay, and first submitted to a rippling process, by means of which the leaves and blossoms or seeds are saved as fodder for cattle. The stalks are then submitted to the action of caustic alkali, bleached and pulped in the usual manner. Paper and cardboard produced from this pulp is also of a firm and excellent quality.

A third material is subjected by the same gentleman to a similar process with a like result. This substance is the hop bine, or twining stems of the *Humulus lupulus*, a material which, in many parts of the country, may be obtained in almost any quantity, and which has been hitherto regarded rather as a nuisance than as a stock to be converted into a valuable article of trade. Instead of being as heretofore, burnt up for manure, Mr. Plunkett has shown that it may be converted into a useful paper, the dried bine yielding from 70 to 75 per cent. of fibrous matter.

The fourth and last of Mr. Plunkett's papers is made from the yellow water-iris (*Iris pseudacorus*), which is not only a very common weed in Ireland, but is also common enough in the marshy parts of England. It yields when dry, about 60 per cent. of available fibre or half stuff, and, as far as one can judge from unsized specimens made by hand, will make a paper equal to that produced from either of the other sources.

Hence it will be seen, that the Irish patents, in each instance, offer a material, not to be used in conjunction with rags or other fibre, but independently, as substitutes for those substances. In each case the raw material is either common enough, or, as in the instance of the Lavatera, may be easily cultivated on waste lands in sufficient quantities to supply all our wants; and beyond this to furnish us with a fibre for cordage and textile manufactures of a new but valuable kind at home, instead of seeking supplies from Russia and India.*

Independently of "substitutes for paper material" at home, and

* The last patented paper material is that of Mr. Haughton, for converting the refuse of flax straw into pulp. The process consists of an application of an alkali, in a heat of nearly 400 deg. Three tons of flax refuse, at from 20s. to 50s. per ton, can, it appears, be converted into one ton of pulp. The rags for the same amount of pulp would weigh one ton and a third, and the lowest price of rags is £15 per ton.

of the premium before alluded to, the reports of the Paris Universal Exhibition contain an interesting account of a paper material now in course of manufacture by a company established at Florence from the common asphodel (*Asphodelus ramosus*). The roots are first made to undergo a process of distillation, during which alcohol is obtained, and the residuum, together with the other parts of the plant, is converted into card paper, cards and paper, including writing papers of various qualities. The gum which abounds in asphodel, is a highly advantageous ingredient; it gives gloss to cardboard, and prevents writing paper from becoming absorbent. The stoutest cartridge paper which is made from this plant is found to bend without breaking, and is not apt to tear. Corsica, Spain, Algeria, Portugal, all have hastened to follow the example of Tuscany, and to seek to derive advantage from asphodel, either as yielding alcohol or paper-stuff, or both. If even the enormous tracts which are covered with asphodel should in time be exhausted, the culture of the plant is by no means difficult. The manager of the Grand Duke's domain, at Alberese, offered, a few years ago, 40,000 francs for the extirpation of the asphodel, in a comparatively limited territory, and no person was found to undertake the next to impossible task. It is stated, moreover, that the asphodel produces alcohol and paper, at a much cheaper rate than any other material which has yet been tested, and there is good reason to hope that it may yet prove a providential benefit to many sterile and unproductive districts.

From North America, I have just received a series of specimens of what our brethren are doing on the other side of the Atlantic in paper stuffs. This series contains white pulps, made from white pine, yellow pine, white cedar, red cedar, hemlock, spruce, white oak, maple, gum, chestnut, ash, bass, sycamore, birch, catalpa, beech, willow, paper mulberry, mulberry bark, black walnut, elm, tulip poplar, hickory, straw, reed, maize, and sun-flower. The American straw papers seem to possess tenacity and quality superior to those of British manufacture. To what extent these wood papers are made and used in America, I have as yet received no information, the promised papers and particulars not having come to hand.

These remarks on new materials for paper, are essentially fragmentary; there are many other substitutes, and some not generally known to the public, which have been patented and experimented upon within the past two or three years; but to enter into any particulars concerning them, would extend this paper far beyond the limits I have assigned to it.

It would not be an uninteresting or impossible inquiry to ascertain the history and progress of this question of rag substitutes for paper during the past seven years—a subject to which I may return at some future opportunity.

Trinity School House, Lambeth.

*The First Galvano-Electric Telegraph.**

It was the Russian Baron Schilling who, at Munich, so long ago as 1816, had invited the Honorable Frederick James Lamb, then British Envoy and Minister Plenipotentiary to the Court of Bavaria, to accompany him to Dr. Samuel Soemmerring, in order that he might see his telegraph, the first ever made to act by a galvanic battery. Schilling having introduced the British Minister to Soemmerring on the 2nd of July of the year mentioned (1816), repeated the visit with him ten days later, the 12th of July, when the telegraph was made to operate before them. Besides the brother of Lady Palmerston and the Russian Baron Schilling, there were on that occasion present also, the Countess Banfy, Schilling's sister and her husband Count Banfy, from Vienna, then on a visit at Munich. Dr. Hamel proves that the date of Soemmerring's invention is nowhere accurately stated. His first telegraphic apparatus was made between the 9th July and 6th August, 1809. Baron Schilling, who was at that time attached to the Russian mission at Munich, saw it for the first time on the 13th August, 1810, and from that day he became an enthusiastic laborer in the field of electric telegraphy. In the autumn of 1812, he was enabled, by means of a subaqueous conductor, planned by him in April and May, at Munich, to explode powder mines across the river Neva near St. Petersburg. Subsequently he made the very first electro-magnetic telegraph, a copy of which, in 1836, found its way through Bonn and Heidelberg to London. In 1837 there was at St. Petersburg a submarine cable making for him, with which he intended to unite Cronstadt with the capital, through the Finnish Gulf. His death, which took place on the 7th August, prevented the execution of this early submarine telegraph enterprise.

On a Peculiar Case in which Baryta is not Precipitated by Sulphuric Acid.† By T. Scheerer.

The author observed, that in the salt of phosphorus employed in blowpipe experiments, which often contains sulphuric acid, the latter cannot be detected by the salts of baryta when the salt has been fused. From this he concluded that metaphosphoric acid prevents the precipitation of sulphuric acid in the form of sulphate of baryta, and further experiments have confirmed this view.

If a large quantity of dilute muriatic acid be added to a solution of metaphosphate of soda, and then solution of chloride of barium, dropped in and mixed by stirring in order that the precipitate of metaphosphate of baryta formed at first may dissolve again in a sufficient excess of muriatic acid and water, the addition of very dilute sulphuric acid to the perfectly clear solution produces no precipitate of sulphate of baryta. After standing for several hours and sometimes

* From the Lond. Jour. of the Society of Arts, No. 328.
† From the Lond. Chemical Gazette, No. 391.

even for days, the fluid begins to grow turbid; but if it be boiled, this operation causes the formation of more or less of a white precipitate.

Repeated experiments showed the author, that the production of these phenomena depends on the degree of dilution of the sulphuric acid, and also that neither the ordinary tribasic phosphoric acid, nor pyrophosphoric acid, has any influence upon the appearance or non-appearance of the sulphate of baryta.

For the Journal of the Franklin Institute.

Description of J. E. Wootten's Improved Water Gauge.

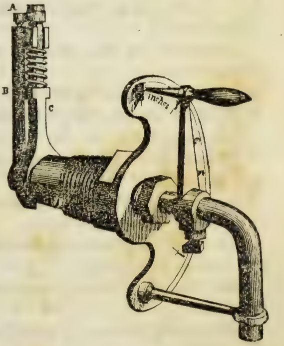
The instrument represented in perspective by the accompanying illustration, is designed for ascertaining the exact level of water in steam boilers.

Its nature consists in being provided with a right-angled tube of about half an inch diameter, with a bore of three-sixteenths of an inch. The arm, B, of this tube, when at rest, stands perpendicularly within the boiler, and should be of such length that when its position is reversed it is capable of reaching the lowest level of water which the boiler may contain with safety.

The other arm passes through a stuffing-box within which it should be free to have a semi-rotative movement upon its axis—and a lever is attached to its outer end for the purpose of imparting to it the necessary motion.

A thread cut upon the body of the instrument serves to make the necessary connexion with the boiler.

The aperture at the upper end of arm B, is covered by a conical valve, A, which is actuated by means of the lower end of valve rod, C, passing over a cam when the instrument is brought into operation. The lift given to the valve is rather less than an eighth of an inch, being quickly raised and held uniformly open during trial. A spiral spring is employed for the purpose of keeping the valve seated when not in use.



A dial is attached to the instrument, which, being graduated in inches, indicates by means of a pointer the height of water (above the lowest admissible level,) which is contained within the boiler at the time of trial.

When it may be desired to ascertain the water level, the handle should be moved in the direction of the figures; the valve, A, is at once lifted from its seat and a passage opened through the tube. When the end of arm B, in its descent has reached the surface of the water, its level is indicated by the position of the pointer in reference to the figures upon the dial face.

Upon restoring the handle to its original position, the valve rod reaches the depression of the cam and the valve is allowed to close.

The advantages of this instrument over the gauge cocks commonly in use, are, its adaptation to denote the *exact* height of water—its freedom from leakage and consequent cleanliness, as well as its non-liability to the choking and stoppage incident to the ordinary form of gauge cock.

The comparatively small space occupied by the instrument is also worthy of consideration. The funnel for receiving the discharged water need not exceed one-and-a-half inches diameter, and the entire arrangement will occupy considerably less room than is required by a set of gauge cocks, with their customary appendages.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, May 19, 1859.

John C. Cresson, President, in the chair.

John Agnew, Vice-President,
John F. Frazer, Treasurer, } Present.
Isaac B. Garrigues, Recording Sec.,

The minutes of the last meeting were read and approved.

Donations to the Library were received from the Royal Institution, The Institute of Actuaries, and Edward Smith, M.D., London; the Austrian Engineers' Association, Vienna, Austria; Prof. A. Dallas Bache, Coast Survey, Washington, D. C.; the Water Commissioners of the City of Detroit, Michigan; the Mechanics' Institute, San Francisco, California; Edward Miller, Esq., C. E., St. Louis, Missouri; J. P. Lesley, Esq., A. J. Brasier, Esq., and Professor John F. Frazer, Philadelphia.

Donations to the Cabinet of Models from Prof. John C. Cresson, Philadelphia.

Donations to the Cabinet of Minerals and Geological specimens from Edward T. Hyatt, Esq., Philadelphia.

The Committee on the Library reported that Henry Seybert, Esq., of Philadelphia, had deposited in the Library, 180 volumes of books and pamphlets, for the use of the members.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement of the receipts and payments for the month of April.

The Board of Managers and Standing Committees reported their minutes.

Five resignations of memberships in the Institute were read and accepted.

Candidates for membership in the Institute (6) were proposed, and the candidates (5) proposed at the last meeting were duly elected.

Mr. Wm. Golding exhibited an eccentric wheel and strap, in which the friction usual to such pieces of machinery is got rid of by means

of friction rollers attached to the strap and bearing upon the face of the wheel.

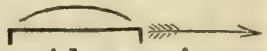
A model of a bridge for short spans, in use upon the Mine Hill and Schuylkill Haven Railroad, was upon the exhibition table for the inspection of the members. It is simple in design, and not expensive. The righting of the bridge is done by means of struts, which abut at the middle of the span, and have their lower ends resting upon plates inclined towards each other, and set against the abutments. These ends stand some distance apart, and are kept from sliding down the inclined plates by a bolt passing through both. By screwing up the nut of this bolt, the struts approach each other and move up the inclined plates, when the abutted ends rise, and with them the cross timber of the bridge. Also, a working model of a switch lever used upon the same road, in which the catch is moved by a supplementary lever operated by the act of grasping the main lever, in the mode adopted for the starting bar of marine and locomotive engines.

A. C. Jones explained his self-acting coupling for fire engine and other kinds of hose, steam, gas, or water pipes, which require to be frequently connected and disconnected.

It is self-fastening and self-tightening in principle. The hose coupling shown to the meeting consists of a brass male and female secured to the ends of the hose in the usual manner; the female is of a conical or flaring form to receive the end of the male, which has a pipe or ring of vulcanized rubber projecting three-eighths of an inch from its interior. This short pipe passes into the female, and the pressure of the water or steam against its inner surface forces it in contact with the surrounding metal, and makes the joint, and its tightness increases with the pressure; all other couplings are the reverse of this, for as the pressure increases the tendency to leak becomes greater.

The coupling may be connected or disconnected by night or day in a second of time without any tools being required, and when constructed, twisting, shaking, or throwing about will not open it; and the more pulling strain is put on it the firmer it becomes locked.

The locking or coupling is effected by a peculiar shaped clamp or pawl resting on a bed between jaws formed on the two sides of the female; this clamp has a shoulder at one end and a broad hook at the other; the shoulder rests against a bearing on the female, and the hooked end drops into an appropriate formed groove extending around the extension of the male.

All the pulling force is applied in a straight line, thus, 
The clamp is kept in place by a pin passing through the sides or jaws, and a small slot in the substance of the clamp; in this narrow hole a small piece of rubber is placed; when the hooked end is raised the rubber is compressed against the pin, and when the pawl is released the elasticity of the rubber restores it to its flat bed.

To couple, the two parts are pressed against each other, the clamps open admitting the male, and the hooked ends drop into the groove, and are kept there when the hose or pipe is without pressure, by the elasticity of the rubber before mentioned; kicking and various other forcible means have been tried to open it, without succeeding. To un-

couple, only one clamp need be raised; this can be effected by the thumb and finger raising the end out of the groove, or a knife, nail, &c., may be used as a lever.

The advantages which the inventor claims over *all* other hose couplings are: that it is *shorter*, *lighter*, *more quickly coupled or uncoupled* by one man, in the *dark* or by daylight; a more *perfect swiveling;* will bear *more* "wear and tear;" sustain *more change of form* without preventing its use; less first cost, and no loose parts to get lost, and that no injury short of total destruction will prevent the use of the section of hose at a fire.

COMMITTEE ON SCIENCE AND THE ARTS.

Report on Mr. S. W. Hall's Thermograph.

The Committee on Science and the Arts constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination "a Thermograph," invented by Mr. S. W. Hall, of Philadelphia, Pennsylvania,

Report:—That the apparatus of Mr. Hall is formed of a spiral glass tube, terminated outwardly in a branch which is prolonged with a smaller curvature; this tube is delicately balanced upon a horizontal axis. The spiral portion of the tube contains alcohol (or any other liquid or gas), while the prolonged branch contains a plug of mercury, which is in contact at its inner surface with the alcohol, while on its other side it has a partial vacuum formed in the outer end of the tube. Of course, as the alcohol expands or contracts, the mercury is moved farther from, or nearer to, the axis, and the change in the position of the centre of gravity of the system causes a rotation around the axis, and this motion is transferred by levers to a needle point, which is lifted or depressed, according as the alcohol is expanded or contracted. In front of the needle a band of paper is made to pass with an uniform motion, communicated to it by rollers which at the same time print upon it a series of horizontal and vertical lines, the former of which correspond to certain temperatures, and the latter record the hours. And, by a modification of its striking works, the same clock work which governs the motion of these rollers, causes a vertical bar to press, at the end of every five minutes, the needle point through the paper, from which it is immediately withdrawn by a spring, thus impressing a permanent and easily visible mark recording the temperature of the instrument at that instant of time.

So far, the apparatus has been constructed, and in action for some time in the Hall of the Institute, as well as elsewhere; and it will be seen by the record submitted to the Committee that its operation is entirely satisfactory, tracing a curve of temperatures by observations so close together that no appreciable error can be committed in determining from it either the maximum and minimum, or the mean temperature of the day.

As to the originality of this instrument, the Committee have no

recollection of having ever seen or read of the application of the expansive force of a gas or liquid to produce a permanent record of temperatures, by the displacement of a mass of heavy matter relative to an axis of motion: they have, therefore, no cause to doubt the originality of its invention.

As to its utility, it appears to the Committee to possess the following advantages:—

1st. The power developed by the instrument is considerable. The mechanical force exerted by the displacement of a mass of mercury with a considerable leverage from the centre of motion, is so great as to ensure the satisfactory operation of the instrument, and to allow of considerable resistance at its working parts without deranging its action.

2d. This instrument is invariable; being once graduated and set, very ordinary care is sufficient to prevent any derangement of its mechanism; its record will, therefore, probably remain the same, without derangement of its zero or change in the length of its degree.

3d. It is, considering its utility, not too expensive. The inventor estimates that a perfect instrument may be made for $20 to $50. This includes, of course, no estimate for ornamentation. For a meteorological observatory, or for the ordinary recording of atmospheric temperatures at home, this is not an extravagant expense. And it does not appear that any more repairs ought to be required for an apparatus of this kind than for the common clock, which forms its basis.

It is, however, only for recording atmospheric temperatures, and for observatories or houses that the apparatus is fitted. It occupies considerable space, and from its structure could not be conveniently carried in traveling, except by sea. As, however, the scale and the motion of the paper may be varied at pleasure within extensive limits, it appears possible to arrange the apparatus either for very delicate registering during a comparatively short time, or for a long continued course. If the clock could be kept in motion, as is now quite possible, there is no reason why the apparatus might not be left to itself, to record the temperatures during a whole year, during which time it would require neither superintendence nor adjustment.

Mr. Hall, moreover, proposes modifications in the form of the instrument, by means of which it may be made to record within an apartment the temperature of the air outside, indicating the actual temperature at every instant, while it records them as usual every five minutes.

He also has devised an ingenious self-recording barometer, on the same general principle of obtaining the record. These instruments, however, will more properly form the subject of separate reports, when they shall have been so far perfected as to be submitted to the inspection of the Committee.

At present, the Committee confines itself to the expression of the opinion that the instrument constructed and exhibited by Mr. Hall is new, ingenious, and useful, and worthy the attention of all who take an interest in meteorological records.

By order of the Committee,

Philadelphia, March 10, 1859. WM. HAMILTON, *Actuary*.

Abstract of Meteorological Observations for March, 1859; *made in Philadelphia, Somerset, and Dauphin Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.*

1859.	PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.									SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.								HARRISBURG, Dauphin Co. Lat. 40° 16′, N. Long. 76° 15′, W. JOHN HEISELY, M D., Observer.					
	Barometer.		Thermometer.			Relative humidity.	Force of vapor.	Rain and Snow.	Prevail'g winds.	Barometer.		Ther.		Relative humidity.	Force of vapor.	Rain and melt'd Snow.	Prevail'g winds	Barometer.		Ther.		Rain and Snow.	Prevail'g winds
March	Mean.	Mean daily range.	Mean.	Daily oscillation.	Mean daily range.	2 P. M.	2 P.M.			Mean.	Mean daily range.	Mean.	Mean daily range.	2 P. M.	2 P.M.			Mean.	Mean daily range.	Mean	Mean daily range.		
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	Direc.	Inch.	Inch.	°	°	Per ct.	Inch.	Inch.	Direc.	Inch.	Inch.	°	°	Inch.	Direc.
1	30·073	·270	34·3	12	8·3	34	·091		N W.	27·818	·187	27·7	4·6	54	·107		N W.	30·016	304	36·0	5·7		N W.
2	30·342	·269	29·3	18	5 0	46	·097		NNW.	27·927	·113	25·7	2·0	59	·121		S E.	30·264	·248	30·3	5·7		N W.
3	29·960	·382	32·3	13	5·5	89	·168	1 723	E S E.	27·422	·505	31·3	6·3	89	·175	0·518	S E.	29·787	·476	33·3	4·3	} 1·038	S E.
● 4	29·438	·522	46·7	20	13·8	39	·167	0·010	S W.	27·136	·286	39·3	8·0	61	·182	0·165	W.	29 241	·546	42·0	8·7		W.
5	29·603	·145	44 0	10	5·0	42	·142		WNW	27·419	·284	35·0	4·3	82	·212		W.	29·543	·302	41·7	1·7		N W.
6	29·987	·384	46·3	18	4·7	43	·180		W.	27·690	·271	38·3	9·3	53	·207		S E.	29·893	·350	43·3	2·3		N W.
7	29·832	·210	44·0	16	2·3	65	·245	0·757	E.	27·418	·272	38·3	10·7	86	·192		S E.	29·707	·226	40·7	2·7	} 1·780	(var.)
8	29·378	·454	45·7	8	5·0	85	·285	0·127	N E.	27·192	·289	40·0	3·7	100	·257	0·623	W.	29·225	·482	45·7	5·0		E.
9	29·815	·437	46·3	17	5·3	32	·133		N W.	27·616	·424	38·0	5·3	72	·221		W.	29·698	·472	47·0	3·3		N W.
10	30·033	·218	43·7	21	2·7	37	·156		S W.	27 662	·049	42·7	6·0	70	·288		S E.	29·904	·206	44·3	2·3		S E.
☽ 11	29·963	·080	50·7	20	7·0	64	·308		S S E.	27·528	·134	50·3	8·7	71	·367	0·275	S S E.	29·795	·109	48·0	4·0	0·353	E.
12	29·806	·154	58·5	14	7·8	59	·375	0·546	S W.	27·573	·138	47·0	5·0	60	·262		(var.)	29·684	·160	56·3	9·0		W.
13	30 050	·244	56·3	23	3·5	26	·175		S W.	27·784	·208	46·7	9·0	61	·340		?	29·930	·245	53·0	3·3		W.
14	29·984	·099	52·7	21	3·7	33	·188	} 1·300	(var.)	27·525	·259	49·3	12·0	92	311	0·257	(var.)	29·804	·142	50·7	3·7	0·848	E
15	29·556	·428	55·7	14	7·7	71	·367		S W.	27·367	·265	39·7	9·7	71	·201		W.	29·429	·377	54·3	6·3		N W.
16	29·983	·427	48·7	16	7·0	40	·179		W.	27·769	·403	37·7	5·3	53	·159		(var.)	29·889	·461	48·3	6·7		N W.
17	30·034	·113	51·0	23	3·0	36	·201		S W.	27·644	·152	49·3	11·7	49	·315	} 1·032	S W.	29·876	·118	51·7	5·3		S E.
○ 18	29·431	·604	58·7	17	7·7	89	·549	0·462	S E.	26·967	·677	52·7	9·3	87	·362		S.	29·114	·759	58·0	6 3	1·133	S.
19	29·335	·220	42 3	5	16·3	51	·142		S W.	27·163	·359	27·3	22·0	100	·153		W.	29·180	·317	41·7	16·3		N W.
20	29·755	·420	45·8	18	7·0	30	·122		W.	27·645	·482	32·7	6·0	64	·152		W.	29·700	·520	44·0	6·3		N W.
21	29·927	·171	45·3	20	1 3	36	·146		WSW.	27·633	·031	48·0	15·3	60	·324		S.	29·826	·141	45·7	1·7		(var.)
22	29 723	·204	54·8	28	9·5	56	·397	0·375	(var.)	27·480	·153	49·3	10·0	90	·328		WSW.	29·622	·204	50·7	5·0	0·172	S E.
23	29·761	·098	55·2	19	4·3	28	·162		N W.	27·602	·122	46·0	8·7	54	·268		(var.)						N W.
24	29·681	·114	50·0	11	4·8	74	·308	0·472	S E.	27 347	·255	54·0	8·0	77	·429	0·164	(var.)	29·535		51·7		0·120	S E.
25	29·514	·167	52·3	15	2·3	76	·380	0·211	(var.)	27·300	·066	40·0	14·0	65	·168		W.	29·368	·167	52·7	4·3		N W.
☾ 26	29·605	·091	42·0	13	10·3	37	·129		N W.	27·412	·112	31·3	8·7	54	·123	0·071	W.	29·531	·162	42·0	10·7		N W.
27	29·656	·051	49 2	22	8·5	53	·236		S W.	27·318	·094	53·7	22·3	67	·385		(var.)	29·475	·097	49·3	10·0		S.
28	29·608	·048	57·0	27	4·5	48	·353		S E.	27·265	·069	55·7	2·7	56	·352		S S E.	29·454	·020	56·3	7·0		S E.
29	29·339	·269	53·7	11	6·7	87	·407	0·520	(var.)	27·081	·191	48·3	8·0	67	·269	0·173	W.	29·162	·293	55·0	6·7	0·617	(var.)
30	29·545	·209	51·0	13	2·7	30	·141		W.	27·353	·267	39·3	9·0	53	·182		W.	29·468	·307	50·0	5·0		W.
31	29·796	·248	48·2	20	4·2	23	·114		(var.)	27·633	·279	39·0	3 7	53	·159		W.	29·755	·286	47·0	3·0		N W.
Means	29·758	·250	48·1	17	6·0	50	·227	6·503	s.67°w	27·474	·238	41·6	8·7	69	·244	3·278		29·629	·283	47·0	5·6	6·061	

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DEVOTED TO

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AND THE RECORDING OF

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JULY, 1859.

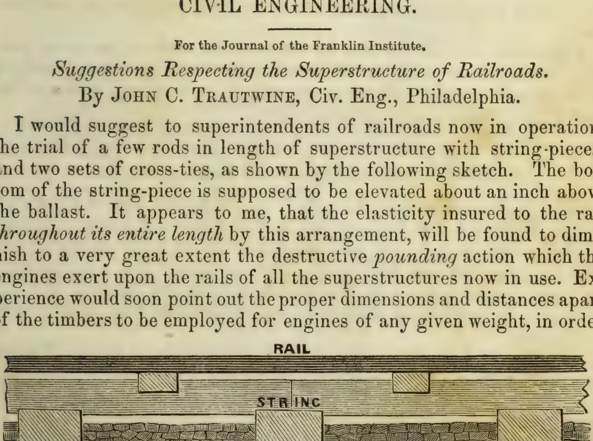
CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Suggestions Respecting the Superstructure of Railroads.

By John C. Trautwine, Civ. Eng., Philadelphia.

I would suggest to superintendents of railroads now in operation, the trial of a few rods in length of superstructure with string-pieces, and two sets of cross-ties, as shown by the following sketch. The bottom of the string-piece is supposed to be elevated about an inch above the ballast. It appears to me, that the elasticity insured to the rail *throughout its entire length* by this arrangement, will be found to diminish to a very great extent the destructive *pounding* action which the engines exert upon the rails of all the superstructures now in use. Experience would soon point out the proper dimensions and distances apart of the timbers to be employed for engines of any given weight, in order



to insure the requisite degree of elasticity, which evidently admits of being varied to any extent which may be found desirable. The increased quantity of timber involved in this proposed plan is a manifest objection to it; but experience only, can indicate whether the attend-

ant advantages which it possesses, may not more than counterbalance this objection, together with any others to which it may be liable. Beside the greater presumed durability of the rail, *from the fact that no portion of it rests on a rigid support;* we should secure a much more efficient rail-joint; inasmuch as the joints would rest *upon* the upper cross-ties, instead of *between* the ties, as is the present preferred practice; thus combining increased strength of joint, with greater uniformity of elasticity. We also should elevate the rail more beyond the influence of snow. Moreover, should this expedient enable us to obtain that certain (uncertain?) amount of elasticity of rail which all engineers concede to be so important a desideratum, it will doubtless lead to the adoption of more efficient supports for the lower cross-ties themselves;—supports which may extend below the influence of rain and frost; and thus effect a very important reduction of expense for rectification of the track,—beside dispensing with the use of ballast.

The great objection to the employment of such supports hitherto, has been the increased *rigidity of track* attendant on them, and by which the destruction of the rail is greatly accelerated. But if we can devise a means of modifying or entirely annulling this rigidity *in the rail*, by a process *entirely independent of the foundation on which the rail rests*, then this objection vanishes; and the way seems to open for arriving at a much more perfect superstructure than has hitherto been used.

I hope that the subject may be regarded by some of our intelligent superintendents as being of sufficient interest to induce them to make a trial of it, if only for a few lengths of rail; and to communicate the result through your valuable Journal.

---

*Substitute for Feed Pumps and Donkey Engines.**

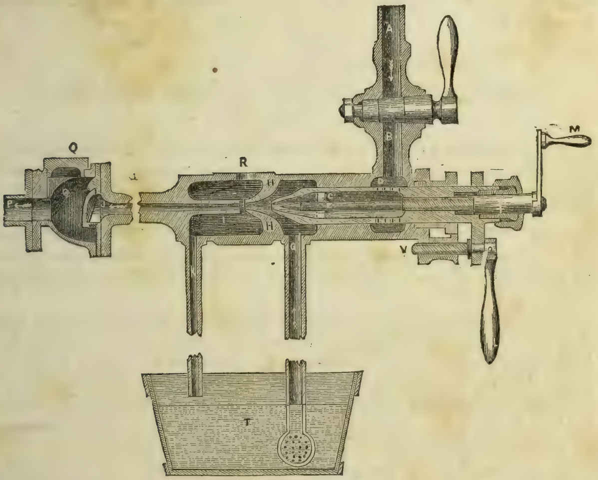
A very curious apparatus, called an *Automatic Injector*, invented by M. H. Giffard, and made by M. H. Flaud, the well-known engineer of Paris, has recently attracted considerable attention amongst scientific and practical men in France. The apparatus has been adopted by the Director General of Naval Construction in France; and has already been ordered by more than one well-known firm in the north of England.

The object of the apparatus is to supply water to the boilers of steam engines, or other steam apparatus, by means of the force of the steam contained in the boiler alone, and to return to the boiler all, or very nearly all of the heat contained originally in the steam thus used as the motor for supplying water to the boiler. It works without any aid from machinery; it is, in fact, perfectly automatic, as the title implies, and, consequently, it acts equally well when the steamboat, locomotive, or engine to which it is attached, is in motion, or at rest.

A B is the pipe bringing steam from the boiler; C D another pipe or chamber which receives the steam from the former through the holes at D—this latter pipe terminates conically; E F, small piston or rod

* From the Lond. Mechanics' Mag., April, 1859.

working by means of a screw or handle, F M; this serves to regulate or prevent entirely the passage of the steam; G is a suction water pipe. The water is drawn up into the chamber which surrounds the conical end of the steam pipe C D, and passes through the opening marked by an arrow between H H. The space left for the exit of the water is regulated by means of the lever and screw L, which moves the steam pipe, or chamber, C D, in either direction; I J, is a passage to carry the water to the boiler, together with the steam which communicates to the water a portion of the force with which it is charged by the pressure in the boiler; O is a valve to prevent the return of the water from the boiler when the apparatus is out of work; P leads directly to the boiler; Q is a screw stopper, to allow of re-adjustment or cleansing of the valve; K is a tube which carries off any superabundant water which may collect in the space around; I R is an opening with a sliding corner, through which the action of the apparatus may be distinctly seen; the steam and water combined forming a continual and rapid stream between the parts H and I.



To work the apparatus—the diameter of the water supply pipe being calculated to give the necessary amount of water—the rod E F is moved forward by the handle M, until the conical end of the rod stops the orifice of the cone. The steam cock in the pipe A B is then turned on; the screw handle M is then turned back a turn or so, to permit a small quantity of steam to pass. The steam in its rapid passage creates a vacuum in the chambers of the apparatus, and the water rushes up the pipe G into the space above. As soon as the water has entered, the handle is turned round so as to draw back the conical rod, and permit

free passage to the steam; the water is then carried rapidly into the boiler, and ceases to run off by the discharge pipe K.

The principle upon which the apparatus is based is, that as the pressure is equal upon all the interior surface of a steam boiler, and consequently as each unit of surface sustains the same pressure, if the steam is taken from the boiler into the apparatus by a larger orifice than that through which it is returned, the force of entry of the steam will be in greater proportion to the dimensions of the two orifices; or, in other words, steam brought from a boiler through a pipe of a given diameter, can easily be forced into the boiler again through the other end of the pipe, provided it have a much smaller aperture. In the machine in question, the entering orifice bears but a very small proportion to that of the supply pipe, because it is necessary to allow for the loss of force occasioned by the action of the water upon the steam.

In the above cut the apparatus is represented in a horizontal disposition, whereas it is now made vertical, but the only difference in the arrangement of the parts is the curving downwards of the two water-pipes G and K.

For the Journal of the Franklin Institute.

Mechanical Expansion Table. By JAMES H. WARNER, Engineer Corps, U. S. N.

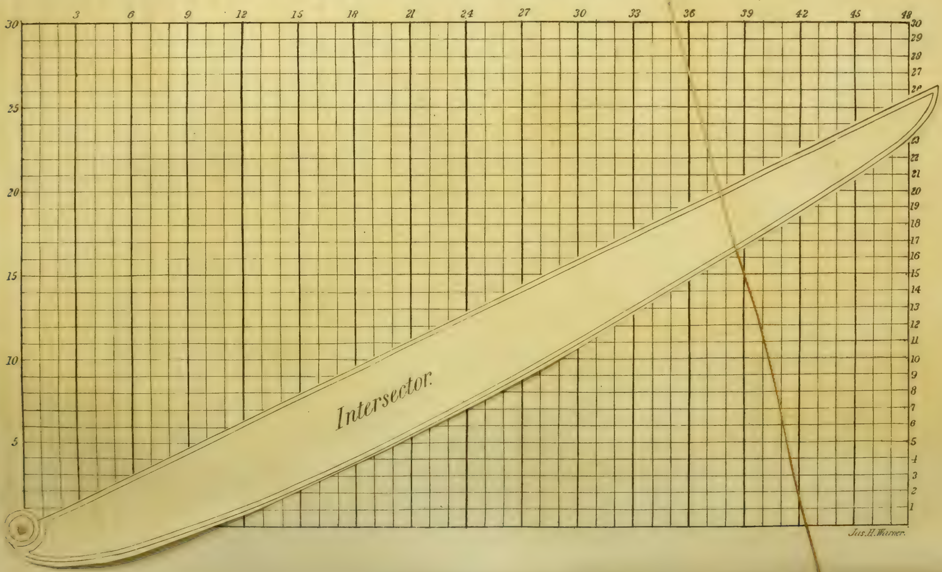
The expansive properties of steam have become so familiar to engineers generally, that to present an example bearing upon the subject may appear somewhat presumptuous. But the following is simply a *mechanical* method of doing that which is, perhaps, better done with figures. This table (Plate I,) is based upon Marriotte's law of expansion:—that the pressure decreases in an inverse ratio with the distance to which the steam is expanded, and of which it is a linear exemplification.

The dimensions of figure may be considered those of a steam cylinder, the vertical lines forming divisions of length, the horizontal lines indicating pressures of steam. These divisions are equal in the diagram, but the divisions of length are not required to be the same as the vertical, or those representing pressures of steam; and although limited in the Plate to 48 inches, and 30 pounds per square inch, may be carried in either direction to any desirable extent.

In explanation, let the pressure of steam be 30 pounds, cut off at 24 inches, and expanded to 48 inches, to find pressure at end of stroke. Bring the edge of the *intersector* to the junction of the vertical line corresponding to the distance to which the steam is expanded, and the *pressure line* 30. Then the point where the intersector cuts the vertical or *cut-off line* 24, indicates the pressure of steam expanded to 48 inches equal 15 pounds. The conditions being the same to find pressure at 36 inches, bring the intersector to the lines 30 and 36, representing pressure and distance. Upon the cut off line we find 20 pounds, the required pressure.

Suppose the pressure of steam equal 25 pounds, cut off at 8 inches,

MECHANICAL EXPANSION TABLE.



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and expanded to 45 inches, bring the intersector to junction of pressure line 25, and distance line 45, we find upon the cut off line 8, the pressure 4, 4 pounds. The same pressure is required for any other pressure and distance. The intersector operating upon the *given* pressure line for any distance throughout the length, the *required* pressure will be indicated upon the cut off line.

This table constructed upon a larger scale will admit of decimal and other subdivisions, giving the pressure sufficiently correct for practical purposes.

The pressures as noted upon the cut off line are the ordinates to a hyperbolic curve corresponding to that degree of expansion.

---

*Ye Anatomie of ye Engineere.**

The *Indian Punch* has the following:—Although an arch man, yet is he never forgetful of gravity; and though he damneth and blasteth more than any other man, he piqueth himself on being always correct in his terms: he is a dab at algebra, for which a Y Z is needful: he is a very Noah at describing arcs. Though he seeketh not after taverns he is conversant with sines, and payeth due attention to his cosines and sick Aunts. Even though not wealthy, he helpeth to establish many a bank. He, ever kind and hospitable, supplieth chairs for sleepers, and though addicted to rail is never forgetful of the tender: he is a dutiful subject and though often in hot water, ever payeth fit attention to the Governor. He is somewhat of an ornithologist, knoweth all about cranes and crows, kites, tumblers, and cocks for hengines, and moreover maketh wire ducks to aid his resonant steam eagles to fly. He is also somewhat of an entomologist, understanding flies, crabs, worms, and such likes, and not above taking notice even of a cows ticks. Though partial to hydraulics he is not otherwise a rollicking man, yet is at home in high dressed attics, where he often maketh use of new mattocks in his area speculations. He is a peaceful man, though well versed in triggernometry, and in the habit of making great use of switches in various ways. He is of levelling tendencies, yet sometimes wisheth he were monarch of all he surveyed. He is the most progressive of mortals, axing his way through forests and picking it through rocks, and, paradoxical as it may seem, he opens a country by putting locks on the rivers and keys on the banks. He is by no means a hater o' docks man, but well versed in dry dock trinal subjects, and would never desire to pull down the church unless it stood in the way of a railroad. He reverenceth the institutions of his country, because in them he recognizeth the mechanical powers. The Press he rightly regardeth as the lever; the ten-pound voters as the small end of the wedge; the House of Lords as the inclined plane, and the Commons as the screw: the Army he conceiveth to be both hammer and tongs combined, the Navy a series of pulleys, and country justices in general pumps. His affection for the constitution is unbounded, for he only regards it in the light of the common wheel.

* From the London Builder, No. 846.

*On the Burning of Welsh Steam Coal in Locomotive Engines.**

By J. Tomlinson.

[Read at the Institution of Mechanical Engineers.]

The use of coal in locomotive engines having become almost the rule, the writer offers the following results of a series of trials he has made with the steam coals of South Wales, in locomotive engines upon the Taff Vale Railway, in comparison with the best descriptions of coke to be had in the same district; as there has hitherto been a difficulty in the use of that description of coal for such a purpose almost amounting to prohibition, from the fact that in all previous trials a failure has resulted from the burning of the firebars. This failure of the Welsh steam coal in locomotive engines has been hitherto attributed to the firebars becoming clinkered over: but the results of the trials described in the following paper appear to show that the failure has arisen from an entirely different cause, and one that can be completely obviated.

The writer was originally driven to the use of coal alone for carrying on the traffic of the Taff Vale Railway in January, 1858, in consequence of the continued strike of the colliers in the Rhondda Valley, where the coking coal is obtained. Previous to that time little or no coal had been used in locomotives, owing to the good quality and low price of the coke: and from the idea that coal could not economically compete with coke for the heavy work of this line, and also from the known difficulties to be overcome in its employment. The transition from coal to coke being sudden and unprepared for, it became necessary to watch the matter closely, so as to determine which of the various descriptions of coal would answer the purpose best, and to arrange its treatment; more especially as at the outset, from the various qualities of coal that had to be used, the firebars were continually being burnt out, and seldom could be made to last two days without passing through the hands of a smith to be separated and straightened; even then several bars a day were totally destroyed in each engine, some engines having had two entire new sets a day to run 100 miles. After careful consideration of the subject it was decided to use only one description of coal; the preference was then given to the steam coal over the bituminous, as being more pure in its composition, and smokeless; and after attentive observation and trials the Aberdare Four Feet Vein coal was chosen. With this coal it was found that the least damage was done to the firebars, and the best result obtained by working the engine with a very thin fire, say not exceeding 9 inches with a moderate load, and slightly thicker as the load increased, not however exceeding 15 inches in any case. In working with a light train or down hill with a loaded train, it was found advantageous to keep even a more shallow fire than 9 inches; for the blast being very light (as little or no traction is required down hill on this railway), the supply of steam could not be kept up unless the air were admitted with little difficulty; it is however necessary to be prepared in case of being stopped, and

* From the Lond. Civ. Eng. and Arch. Jour., May, 1859.

therefore a bright fire was a desideratum which could not be obtained unless it were kept thin.

The injury to the firebars was however still a great item, notwithstanding all the care that could be bestowed on them; for it is difficult to get a number of men to attend implicitly to rules which give them more trouble than they have previously been accustomed to. The writer therefore was induced to try an experiment by covering up the entire surface of the bars with small pieces of firebrick, not exceeding 3 ins. cube, and putting the fire on them, so as to prevent the direct action of the fire on the iron of the bars; and it was found that from the clean nature of the coal no bad result took place in the generation of steam, while the bars now received little or no injury. This plan has consequently been generally adopted, but with the partial substitution of clinker from stationary engines instead of firebrick alone. It has completely obviated the difficulty of the bars being burnt, and a set of bars will now last on an average four months, running about 100 miles a day. It is also attended with a beneficial result; for the small coal, instead of passing directly into the ashpan unconsumed; adheres partially to the red-hot brick and clinker, and is consumed; and notwithstanding that the Welsh steam coal falls readily to small, and has little if any binding property, the engines can run 100 miles without cleaning out the ashpan. Another description of coal containing a larger percentage of ash has also been tried for getting up steam and making the first fire to start with, which clinkering slightly on the bars most effectually protected them from burning: the use of this coal was however limited to 5 cwt. per day for each engine.

To place the engine more out of the control of the men, the plan was adopted which had been in use on other engines, of perforating the shield of the firedoor and drilling five or six two inch holes in the door itself, so as to admit a little air above the fire; this was found useful not only in assisting combustion, but also in preventing the blast from lifting the small particles of coal and thereby choking the tubes.

Having so far succeeded in efficiently working the traffic entirely with coal, and finding the engines were working the trains with a smaller weight of fuel than they had previously done, the writer was disinclined to return to coke without good reason, after the experience he had had. A series of experiments was therefore made to test the commercial value of each description of fuel. The first series of experiments was made with an engine working the regular mineral trains, with Aberdare Four Feet coal and Rhondda Valley best coke: the second series, with the same coal and coke, with a special train of thirty-five loaded coal wagons weighing 269 tons, run at the regular speeds of the ordinary trains of about $11\frac{1}{2}$ miles per hour: the third series, with various fuels, with a special train of forty loaded coal wagons weighing 314 tons, run at a speed of twenty miles per hour up the hill and twelve miles down (twelve miles per hour being the limit down hill with loaded trains): and the fourth series, with bastard steam coal and Aberdare Nine Feet coal: the former of these has a larger percentage of ash and more bituminous property, the only objection

to its use being the smoke: it does not burn the bars, and is fully as economical as the pure steam coal.

The whole series of experiments were made with the same engine and by the same engineman. The engine is of the following dimensions: cylinders 16 inches diameter and 24 inches stroke; six wheels coupled, 4 ft. 6 ins. diameter; firebox 3 ft. 6 ins. square by 4 ft. 10 ins. high; 156 tubes, 13 ft. 3 ins. long by 2 inches diameter, and No. 11 to No. 14 wire gauge thickness; safety valves loaded to a pressure of 110 lbs. per square inch.

The following table gives the general results of the whole of the experiments, showing the quantity of fuel consumed per ton per mile, the quantity of water evaporated per pound of fuel, and the average speed of the train during running:—

Description of Fuel.	Fuel consumed per ton per mile.	Water evaporated per pound of fuel.	Speed in running miles per hour.
	lb.	lbs.	miles.
Coal—Aberdare Four Feet Vein, .	·127	7·63	11·5
Coke—Rhondda Valley Best Coke,	·172	7·62	11·5
Coal—Aberdare Four Feet Vein, .	·130	8·37	11·5
Coke—Rhondda Valley Best Coke,	·124	8·34	11·3
Coke—Rhondda Valley Best Coke,	·136	7·54	16·8
Coal—Aberdare Four Feet Vein, lump,	·133	7·73	16·5
Coal— " half lump and half small,	·153	7·11	14·8
Coal—Rhondda Valley Bastard Steam Coal	·110	8·63	11·5
Coal—Aberdare Nine Feet Vein, .	·112	8·15	11·5

The results in the consumption of fuel showing in all cases slightly in favor of the coal, they may fairly be considered equal; and as the abuse of the engine when burning coal is more easily detected than when using coke, this forms a further advantage in favor of coal. The preference may also be given to coal over coke for the freedom in generating steam, which will allow the blast pipe to be of larger dimensions than when burning coke. This has been clearly shown, as the engines are now maintaining steam at 100 to 110 lbs. per square inch with coal, with the same sized blast pipes as were used previously for 80 lbs. with coke; and the firebars have also been placed closer together, the air spaces being reduced from 1 inch to $\frac{5}{8}$-inch. Hence the writer thinks it may be concluded that the Welsh smokeless coal may be economically used in substitution for coke; and that where failures have taken place previously, they are to be attributed to the very great heating power of the coal; and that the difficulty with firebars has resulted not from clinker, but from the absence of a proper protection for the iron of the bars, so that with heavy firing the heat has struck downwards and fused the bars themselves.

Nearly all the engines on the Taff Vale Railway are now burning Welsh steam coal entirely; they take with each train a load of eighty empty wagons averaging $3\frac{1}{4}$ tons each or 260 tons total, up an average rising gradient of 1 in 309, at from 13 to 14 miles per hour without any inconvenience.

The composition of the Aberdare Four Feet Vein, the coal now in use in these engines, is

Carbon,	90·25
Hydrogen,	4·12
Oxygen,	2·25
Nitrogen, &c.,	2·13
Ash,	1·25
	100 00

It is therefore practically coke, and requires only proper treatment for substitution in the place of coke. Another great advantage in the use of this coal over all others in locomotive engines is its almost entire freedom from smoke, thus rendering any plan of smoke-burning unnecessary, not even a steam jet being required when the engine is standing.

The advantage of slow speed is so distinctly shown in the results obtained that the writer considers this point as worthy of more attention than it usually receives on railways; for a slow speed not only economizes the quantity of fuel consumed by diminishing the resistance of the train, but also increases the evaporative duty obtained from it.

Discussion.—Mr. Tomlinson explained that the firebrick was merely broken up into small pieces of about 3 inches cube, and thrown in roughly with a shovel in a single layer over the grate, so as to cover the firebars; it was found to last a long time, and in one special trial that he had made to ascertain its durability the fire was not dropped for six days, the engine running continuously 100 miles per day, and at the end of that time the firebrick still remained as an efficient protection for the grate bars. The thickness of the fire was an important point: it might be 9 or 10 inches thick at the sides, where the absorbing surfaces of the firebox kept down the temperature; but should be as thin as possible in the centre, so that the bars could just be seen through it, for the bars would go down in the centre in spite of all precautions, unless the fire was kept very thin, on account of the intense heat. By the experiments the injurious effect of increased speed was remarkably shown, not only in increased consumption of fuel, but also in diminished evaporative duty of the fuel, which was reduced about 10 per cent. by an increase of speed of $5\frac{1}{2}$ miles per hour, or about 50 per cent. In the trial that he had made of Newcastle coal, he had found that the bituminous Newcastle coal demanded very different circumstances for its economical consumption, requiring a much greater supply of air; it consequently received imperfect treatment in ordinary locomotive fireboxes, where no provision was made for an extra supply of air beyond that admitted through the grate; so that the evaporative duty obtained in the trial was only $5\frac{1}{4}$ lbs. of water per pound of fuel.

The results of the trials in consumption per ton per mile were not always thoroughly reliable as a means of comparison, on account of the great fluctuation in the weight of trains down, some being as much as 700 or 800 tons down hill, which would materially affect the result; the fall was nearly uniform from one end of the line to the other, amounting to 409 feet in 24 miles, or an average gradient of 1 in 309. The coke cost 12*s.* 6*d.* per ton and the coal 6*s.* 8*d.* per ton in the wagons upon the railway; so that the cost of fuel when coal was used was little more than half of that with coke, as the consumption was about the same in quantity to do the same work.

Mr. R. Laybourn said he had made some trials of burning Welsh coal in locomotives on the Monmouthshire Railway, about eighteen months ago, with coal from Nixon's Deep Duffryn seam, the same seam of coal as the Aberdare Four Feet Vein, but found the bars came down in the way described: this was obviated by using inferior coke for lighting the fire, which formed a portion of clinker over the bars that served to protect them; by this means he succeeded in using the coal. He had made a series of experiments, which led him to the adoption of a considerable proportion of coal mixed with the coke for the locomotives on the Monmouthshire Railways. In the half year ending December, 1855, and previously, coke alone had been used, at an average rate in that half year of 40 lbs. per mile for all the trains, passenger and goods, costing 3·12*d.* per mile of the trains for fuel. In the following half year to June, 1856, a quantity of coal was mixed with the coke; and in the next half year to December, 1856, this was increased to an average of 22·73 lbs. of coal per mile and 17·85 lbs. of coke, making a total consumption of 40·50 lbs. per mile, at a cost of 2·56*d.* per mile of the trains for fuel. The proportion of coal was then further increased, and the results were:—

In the half year ending	Coal.	Coke.	Total Consumption.	Cost of Fuel.
June 1857,	39·25 lbs.	5·60 lbs.	44 85 lbs. per mile.	2·09*d.* per mile.
Dec. 1857,	39 71	5·20	44·91 "	2·13 "
June 1858,	34·15	7·21	41·36 "	2·10 "

He had not tried firebrick, but by getting up the fires with inferior coke a clinker was formed over the grate, which was found to answer the purpose of protecting the bars.

Mr. Tomlinson said that the weights given in the tabular statement of experiments were those of the trains alone, independent of the engine and tender, which would add about 45 tons, the engine being about 29 tons weight and the tender 16 tons.

Mr. B. Fothergill had been engaged recently in experiments on this subject, and he agreed entirely with the statements in the paper, as to the efficiency of coal for locomotives in place of coke; and that the quantity of coal required was not greater to do the same work, if suitable provision was made for its proper combustion. His experiments had been made with the partially bituminous coal of Lancashire and Yorkshire; and he had also made one trial with the Welsh smokeless coal in a locomotive engine, but it was impracticable to complete that trial in consequence of the firebars melting down upon the trip, so as

to stop the engine after having run only a short distance. It was not from defect of the coal that this stoppage of the trial took place, but entirely from the melting of the firebars; and it was evident that without some provision for protecting the bars from melting, the Welsh smokeless coal could not be employed in locomotives. In two trials he had made, the cost of fuel for taking the same train over the same distance of 96 miles was found to be with coke at 11*s.* 6*d.* per ton, 22*s.* 3*d.*; with coal at 5*s.* 3*d.* per ton, 9*s.* 5*d.*; showing a saving of 57 per cent. in the cost of fuel consumed when coal was used. Locomotive engines using coal might always be made to burn their smoke satisfactorily. A point of great importance was the relative durability of the boiler tubes and firebox with coal and with coke; and after the practicability of using coal with great economy in cost of fuel had been established, this became a serious question in deciding whether to go on making coal-burning engines instead of coke engines. It had been feared at first that there would be a loss from more rapid destruction of the brass tubes and copper firebox with coal than with coke; and he had been recently engaged in an investigation of the subject on the London and South Western Railway, where coal-burning engines had been worked for a long time, for the purpose of ascertaining the real lifetime of the tubes under the two circumstances. The result was found to be that in twenty-six coke-burning engines the average duration of a set of brass tubes was 94,518 miles, varying from 65,000 to 127,000 miles, according to their quality, and the description of coke used. But in several engines running with half coal and half coke, the tubes had run 154,955 miles, and were still in good working condition; and in one of these engines the tubes after 137,676 miles work were not half worn out, and were reduced in thickness only from No. 13 to No. 16 wire gauge, or from ·095 to ·065 inch. From the results of this investigation he was satisfied that the ordinary wear of the tubes was caused mainly by the cutting and abrading action of the hard particles of coke drawn rapidly through the tubes, and was not entirely a chemical action as had been at first supposed; and consequently the comparative softness of the particles of coal greatly reduced this cause of wear. This was illustrated by the wear that ordinarily took place in the fire boxes of coke engines, in which the roof and upper portion were reduced only $\frac{1}{32}$-inch in thickness, whilst under the firedoor and at the lower part of the sides, where exposed to the continued wear of the hard pieces of coke, the thickness became reduced $\frac{1}{8}$-inch in the same time. He was satisfied that the durability both of tubes and fireboxes would prove much greater with coal alone; and that there was no ground to fear more chemical action from sulphur with coal than with coke.

Mr. Tomlinson said that the quantity of sulphur in the Welsh steam coal was very small, and was included in the 2·13 per cent. of nitrogen, &c.; in the Four Feet Vein the proportion of sulphur seldom exceeded from 1 to $1\frac{1}{2}$ per cent., and was never more than 2 per cent.

Mr. W. G. Craig said he was satisfied that the tubes had a much greater durability with coal than with coke. For the purpose of burning coal he had used a firegrate constructed with each alternate bar

raised one inch above the others, making a kind of hollow fire, leaving spaces for air to enter under the fuel; the bars were not found so liable to burn in that arrangement as with a level grate, being protected by a greater supply of air on their top surface; a set of bars now lasted several weeks with coal, instead of only one week as before when they were all level.

Mr. J. Fenton observed that the low evaporative duty obtained from the Newcastle coal, when burnt without consuming the smoke, showed the great importance of insuring a sufficient supply of air for bituminous coal, and a considerably larger quantity than was required for a coke fire.

Mr. W. Smith remarked that he had seen a construction of cast iron channelled firebars by Mr. Gray, in an application of which every alternate bar was raised about $1\frac{1}{2}$ inches above the rest: sloping notches or channels were made across the top edges of the bars, to afford an increased area for supply of air; several sets were at work in London, burning coal, and they appeared to answer satisfactorily, giving an increased supply of air, and lasting longer than the ordinary bars from the greater cooling effect of the air.

Mr. Tomlinson said he had tried a set of Mr. Gray's firebars for a stationary engine grate under a large Cornish boiler, but had not found there was much advantage over a set of thin cast iron bars which he had tried in a companion boiler of the same description; the latter bars were $3\frac{1}{4}$ inches deep by $\frac{3}{4}$-inch thick at top and $\frac{1}{2}$-inch at bottom, with $\frac{3}{4}$-inch spaces. In both boilers the firedoors were perforated in the same manner as the locomotive firedoor, and provided with sliding shutters to close the air holes; there was also a damper below the fire to shut up all close when the incline was not being worked. He thought that in practice the channels across the bars were more frequently filled with dust than clear, and hence the absence of any good effect resulting from them. The bars that he used for locomotives were wrought iron, $4\frac{1}{2}$ inches deep by $\frac{7}{8}$-inch thick at top and $\frac{5}{16}$-inch at bottom, and $\frac{5}{8}$-inch spaces when new. In some engines the same set had lasted five months when burning about 45 lbs. of coal per mile and running about 500 miles per week: their average duration was about three months, which was gradually increasing.

Mr. R. Laybourn observed that an important consideration in the matter was the great variation in the quality of coal obtained in different districts, so that a special plan had to be arranged on each different railway to suit the coal to be used there. He had made a trial of a plan of firegrate by Mr. Jeffreys, of the Shrewsbury and Hereford Railway, in which the bars were laid flatways on the side instead of the edge, with air spaces between, and partly overlapping one another, forming a gradually sloping surface from each side of the firebox down towards the centre; this arrangement proved successful in admitting a larger supply of air, and he found it effective in burning the bituminous coal.

Mr. Maudslay observed that this was similar to Mr. Crampton's firegrate, that was used on the French railways, except that in the

latter the bars were laid transversely instead of longitudinally in the firebox, forming a surface sloping down from the firedoor towards the tube plate.

Mr. E. A. Cowper observed that in Mr. Gray's plan of firebars that had been referred to, the general arrangement he believed was to have $\frac{1}{2}$-inch bars and $\frac{1}{2}$-inch air spaces, giving 50 per cent. area of opening in plan for the admission of air; but the effective area was increased to 60 or 70 per cent. by cutting sloping notches in the top edges of the bars, so that portions of the top surface of the bars were cut away. He did not know what were the results of their working, but thought the use of very thin bars fully answered the purpose required; he usually employed bars only $\frac{1}{2}$-inch thick at top and $\frac{1}{4}$-inch at bottom, with $\frac{5}{8}$-inch spaces.

Mr. Tomlinson said that a set of Mr. Gray's firebars had been tried for some time in the "Iron Duke" locomotive engine on the Great Western Railway; but he did not think any plan of stepped grate would be suitable for burning the Welsh coal, for he found that if any one of the ordinary bars was accidentally left standing up above the others, from the notch in the firebar frame not being cleaned out, it was sure to get burnt more than the rest.

Mr. E. A. Cowper had heard that a plan had recently been tried in some locomotives on the Great Western Railway, for tipping up the entire firegrate upon a centre bearing, so as to allow of laying the fresh fuel on the bars, and then covering it over with the red fire when the grate was tipped back again sharply.

Mr. R. Laybourn believed that was Mr. Jeffreys' plan, and was intended as a mode of making cast iron bars suitable for locomotive firegrates; this was effected by never disturbing the cast iron bars on their bed, and they were never removed until worn out; but when the fire had to be dropped the whole frame was tipped over on a centre bearing, allowing the fuel to drop out. This plan gave great economy in the cost of maintenance of firebars, as cast iron was used instead of wrought iron bars; and the bars were preserved from injury by avoiding the handling of them whilst hot, which was liable to bend or break them.

Mr. J. Fernie said an arrangement of ridged firebars had been tried for a stationary engine boiler at Derby, on Mr. Chanter's plan, in which the top of the bars was ridged or serrated, and every alternate bar was moved longitudinally about 1 or $1\frac{1}{2}$ inch backwards and forwards, the intermediate bars remaining stationary; the alternate bars were moved by a transverse shaft provided with a lever, which was moved occasionally by the stoker. These had been in use about two years, and were found to answer the purpose satisfactorily; the ridges on the bars served to keep the fire gently stirred, preventing clinkers from adhering to the bars.

Mr. W. G. Craig observed that for burning coal it was requisite to have the bars rather close together and very thin, considerably more so than with coke; and the object he had in view in using a grate with the alternate bars raised above the others was to admit more air under

the fuel, making a kind of hollow fire, to prevent the bars from burning. The firebars he used were $\frac{7}{8}$-inch thick at top and $\frac{1}{2}$-inch at bottom, with $\frac{3}{4}$ to $\frac{7}{8}$-inch air spaces, and when placed alternately raised, they could be brought still closer.

Mr. J. E. Clift inquired whether a pan of water had been tried under the firegrate, to prevent the bars being burnt; that plan was frequently used in stationary engines with good results, and by this means he had had firebars in constant use for two years with intense coal fires under gas retorts, without the bars burning away. There was constantly a supply of water under the firegrate, and the steam rising from it served to keep the bars continually protected and cool.

Mr. Tomlinson said he had tried a jet of water from the boiler kept continually running under the firegrate of a locomotive during the whole trip, but it did not serve to protect the bars from burning; he had not tried a pan of water, but with the jet there was so much water constantly supplied as to keep the ashpan full of steam, and he thought the effect would be the same as in the use of a pan of water.

Mr. C. W. Siemens observed that the efficiency of the water below the firegrate would depend a good deal upon the quantity of ashes falling from the fire; if the ashes fell easily they would keep up a supply of steam from the ashpan and preserve the bars from injury; but if much clinker were formed on the firegrate, the water pan would not answer, as there would not be steam enough to keep the bars cool.

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*On a New System of Axle Boxes, not requiring Lubricating, and without Liability to Heating.** By Alphonse dè Brussaut.

The author first recapitulated the liability to accident arising from inattention to the constant greasing of the ordinary axle boxes and journals of carriages and of machinery, the inconvenience of accumulating dust and grit on the bearings, and the friction and wear and tear arising from these causes. He then reviewed the numerous inventions and attempts to remedy these evils, showing that none of them had hitherto successfully abolished the necessity for the expensive and uncleanly use of some lubricating matter. He next proceeded to describe the system which he had introduced, and had applied somewhat extensively in France to various classes of machinery in which the use of grease had hitherto been considered indispensable. The new apparatus was described to consist of a series of four, six, eight, or any other convenient number of cylindrical rollers of the length of the journal, retained at certain distances apart from each other, yet still united by elastic bands of vulcanized india rubber. These rollers, thus united, and placed around the journal, would be set in motion by the pressure of the axle, without the possibility of collision with or friction against each other, or of rubbing upon the surface of the journal or of the bearing, and thus avoiding as much as possible any friction or opposi-

* From the Lond. Civ. Eng. and Arch. Journal, May, 1859.

tion to the motion of the journal. The action of rolling being thus substituted for sliding, there could not be any abrasion of the substances, and lubricating became unnecessary. The machines so fitted were stated to work with remarkable ease and steadiness, and to be set in motion and the speed to be kept up with considerable facility. No inconvenience had been experienced from the fracture of the elastic bands and shafts, making 450 to 500 revolutions per minute, working perfectly well, without any symptom of heating.

The reasons for this action were stated in a plain and comprehensive manner by showing that in moving a body of an octagonal form along a plane the action must be either by sliding or by rolling; in the former lubrication was necessary, whereas in the latter the presence of any lubricating matter would be prejudicial. Extending the latter principle to the cylindrical form, which was merely a body having an indefinite number of sides, it was evident that by retaining these cylinders apart by means of the elastic bands, so as to avoid friction against each other or upon the journal or the bearing surface, a practically perfect rolling motion would be obtained, and it was contended that by M. Brussaut's system the two material results of rapid rotation without heating, and a complete suppression of the use of grease in all journals of machinery were arrived at.

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*Cheap Railway Fare.**

We see by the time tables that the South Western Company are carrying passengers in covered carriages on Sundays to Portsmouth and back for 4*s.* each. We do not say that this is any thing extraordinary for a railway company in these days to do, but as the distance to Portsmouth is 94½ miles, a passenger is thus carried 189 miles for 4*s.*, or just about ¼*d.* per mile, which surely is cheap enough.

It is difficult to run a train, especially a long one, for less than 2*s.* per mile, including every expense commercially chargeable against it. It would therefore require 200 passengers at ¼*d.* per mile per passenger to be in a train, in order to work at about 50 per cent. expense; to net half the receipts as profits. We do not know how many passengers these very cheap trains (to Portsmouth, Salisbury, &c.,) average, but we dare to say it is not less than 200. It is work almost as cheap as carrying coals at ½*d.* per ton per mile. If no more passengers than 200 are found in such train, it is in point of fact cheaper than coals at ½*d.* a ton a mile.

Such cheap fares are calculated to render railway traveling popular, and if the million can be attracted to the railway, benefit will follow to the railway companies and the public, for nothing is more healthy than a trip every now and then in the country, and as it is the case, that as many as 500 or 600 persons can be easily conveyed in one train, fares of only ¼*d.* per mile per passenger would be handsomely remunerative obtained from a train filled with so many passengers.

* From Herapath's Railway Journal, No. 948.

AMERICAN PATENTS.

List of American Patents which issued from April 19 to May 10, 1859, (inclusive,) with Exemplifications.

APRIL 19.

216. Steam Boiler Furnaces; Jonathan Amory, West Roxbury, Massachusetts.

Claim—The method of increasing the combustion and protecting the combustion curves, as described.

217. Device for Converting Alternate Circular Motion into Direct Circular Motion; Abraham Bartholf, City of New York.

Claim—The dog, spring, and lever, combined and arranged relatively to each other and applied to the wheel, or its equivalent, as described.

218. Burial Cases; A. C. Barstow, Providence, Rhode Island.

Claim—Constructing a metallic burial case with the ogee-shaped ends, whereby great reduction in weight and economy in the manufacture is secured, and at the same time all the space required afforded. Also, forming the metallic case with the overlapping strengthening ribs.

219. Furnace for Heating Tire; M. Battel, Albany, New York.

Claim—A furnace, composed of an annular body, fire space, central tube, with cover or damper therein, to regulate the draft, extension, rod, crane, top, and otherwise constructed as described.

220. Anchor Tripper; T. L. Baylies, Richmond, Indiana.

Claim—The arrangement and combination of the tripping bar, shaft, and cams, as described.

221. Machine for Filing Saws; A. M. Beardsley, Elkhart, Indiana.

Claim—1st, The arrangement of the swinging frame of the file carriage upon the adjusting plate, so that it can be turned over and supported upon the bed-plate, in the manner described. 2d, The arrangement of the check pieces upon the adjusting plate, between the arms of the swinging frame, for the purpose of bracing the latter against the thrusts of the file carriage, while said frame is free to rise and fall. 3d, The arrangement of the gauging screw in the cross-piece of the swinging frame, by which the teeth are filed to a uniform depth, without interfering with the rising of the file carriage, to conform to the taper of the file. 4th, The arrangement of the seats at each end of the bed-plate, whereby the implement may be supported directly upon the clamp of the saw.

222. Artificial Legs; Douglas Bly, Rochester, New York.

Claim—The use of an elastic strap or apparatus from the shoulders, or upper part of the body, when attached to the artificial leg in such a manner that its contractile power is exerted in connexion with the backward motion of the shoulders, to produce the forward motion of the foot.

223. Washing Machines; Benjamin Bradbury, Abington, Illinois.

Claim—The arrangement of the levers and pitman moving the dashers over the concave of the box.

224. Faucets; C. K. Bradford, Lynn, Massachusetts.

Claim—The faucet, to be operated by applying pressure directly to the head of the case, said case for this purpose being provided with an outside elastic diaphragm forming the head thereto, and combined with a valve rod, arranged in relation to the case internally, so that the ends of said rod terminate respectively at, and are secured to, the valve and diaphragm.

225. Bedstead; Wm. H. Bramble, Springfield, Ohio.

Claim—1st, The combination of an under and upper section, united to each other by springs and links, so that the upper section may have a free, vertical, and horizontal motion. 2d, In combination with a bedstead made of two sections, the making of the posts of the upper section shorter than the supports of the under section, so that said upper section, when placed on the lower one, shall be entirely clear of the floor. 3d, The combination of the loose slats, springs, and webbing, when said webbing runs longitudinally or lengthwise of the bedstead.

226. Cooking Range; B. Wells Dunklee, Boston, Massachusetts.

Claim—The arrangement of the two induction flues, the gauge throats, their plates or bars, and the flues around and between the two ovens, a single damper, and its openings, being placed over the middle flue, and with respect to the two flues.

227. Governor for Steam Engines; John Broughton, City of New York.

Claim—Effecting the connexion between the ball arms and the central rod, by means of two levers and two links, applied and operating as set forth.

228. Lubricator; P. G. Brown, Schenectady, New York.

Claim—The combination of the reservoir, provided with a discharging aperture, valve, having a receiving aperture in it, and air chamber, or the equivalents thereof, when said air chamber is arranged to control or assist the discharge. Likewise, giving to the valve which conveys the oil from the reservoir to the discharging aperture an intermittent revolving motion, in one and the same direction, for and by the action of the handle, in either direction of the travel of the latter, or in reverse directions thereof.

229. Lock; George Clay, City of New York.

Claim—The arrangement of the following parts for united operation in a lock, viz: right and left double-walled case, sliding right and left key-hole guard plates, right and left forked bars, main and auxiliary tumblers, and bolt.

230. Railroad Car Brake; Wm. E. Cooper, Dunkirk, New York.

Claim—The arrangement of the bell cord, pulleys, and movable pulley block, with the brake cord, connected and operated for the purpose of setting all of the brakes in the entire train, simultaneously and from any point within the train.

231. Journal Boxes; Rienza Daniels, Almena, Michigan.

Claim—The axle furnished with a screw-tapped arm, and having toothed and plain sections of a journal

arranged and clamped upon it, in combination with the internally toothed journal box, and with rods, toothed and plain sections of frictional rollers, arranged and clamped on them, in the manner described.

232. HARVESTING MACHINE; George Esterly, Whitewater, Wisconsin.

Claim—1st, The adjusting of the rake by means of the socket, suspended by journals or trunnions, and secured in the desired position by set-screws and bars, or their equivalents, in combination with the adjustable platform, whereby the rake and platform may be adjusted to suit the height the grain is being cut. 2d, The segment plate with the curved flanch, for the purpose of carrying the rake backwards. 3d, The use of the pendant rod or bar provided with the rollers, in combination with the flanch. I do not claim the guard finger—but I claim, fourthly, attaching the guard finger to the bearing, in the manner described, whereby it may be adjusted, for the purpose specified.

233. MACHINE FOR QUARRYING STONE, &c.; Jonah Ellis, near Warrington, England; patented in England, December 6, 1855.

Claim—A portable apparatus, designed for cutting grooves in rock, or other mineral substances, for the purpose of quarrying the same in blocks, and consisting of supports which are fastened to the rock and sustain an adjustable bed-plate and screw-shaft, upon which bed-plate and screw-shaft a tool stock and adjustable cutter is made to traverse between two previously drilled or open spaces which form the extremities of the proposed cut.

234. WATER-COOLER FOR STEAM ENGINES; Robert G. Eunson, City of New York.

Claim—The use or employment of a decalorator, such as is described, or its equivalent, when the series of very small horizontal tubes are so arranged in respect to the current of water outside of the tubes, that the centre of each tube, in one row, shall be opposite, or nearly opposite, to the centre of the space between the tubes in the next row, in combination with supporting and directing tube plates, as described. Also, the use or employment of tubes, arranged in rows, in combination with the tube plates and shell of the decalorator, when so arranged that the current of cold water is made to flow across the tubes, being directed by the tube plates from side to side or from top to bottom, and from bottom to top of the shell, and around the tubes, being made to encircle them by its current, in consequence of their arrangement of rows, and at the same time, progress lengthwise of the shell and tubes in a direction contrary to the stream of fresh water inside of the tubes, for the purposes set forth.

235. FIREMAN'S LADDER; Daniel Fitzgerald, City of New York.

Claim—1st, The applying the tanks, or their equivalent, to ladders, with or without water, to elevate and hold said ladders, as described. 2d, Conveying the water through a long distance by an elongated pipe, or its equivalent, connected with the apparatus. 3d, Managing the curved or jointed pipes, by means of the lever, in the manner described.

236. MOULDS FOR STEEL CASTINGS; Perry G. Gardiner, City of New York.

Claim—1st, The constructing the mould with a cup or reservoir for holding all the melted metal for casting, closed and opened at the entrance of the sprue by the movable plug or stopper. 2d, The spherical hollow chamber, and air escape passage, and self-acting plug, to permit the rarified air to pass from the mould, and to escape, and to shut off the external air from the mould. 3d, The combination and arrangement of the two cups, the sprue, the figure, the tool or casting, and air-vents or passages, so as to form a bent tube by which the casting is filled from the bottom, and the external air excluded. 4th, The use of the moulds in a state of intense heat, never less than 500° Fahrenheit, and generally at a much higher temperature, for the purpose of producing, as nearly as practicable, a vacuum within the mould—but I do not claim the mere heating or warming of the moulds to produce a smooth casting, that having been a common practice heretofore.

237. MACHINE FOR SMOOTHING SOLES OF BOOTS AND SHOES; Othniel Gilmore, Raynham, Massachusetts.

Claim—The improved manufacture of a sole-smoothing or reducing wheel, made with the convex grinding annulus, concentric heel recess, and acute angled edges.

238. OVEN FOR COOLING CASTINGS; P. F. Geisse, Wellsville, Ohio.

Claim—The pipe, connecting the eyes or hubs of the wheels with flues and plate, for causing the current of air to pass through the eyes only of the hubs in cooling, in combination with heating oven and pits, operating as described.

239. MODE OF ATTACHING CASTERS TO TRUNKS; Isaac H. Giffing, City of New York.

Claim—The method described of constructing and attaching casters to trunks.

240. YOKE-RING ATTACHMENT FOR THE POLE OF OX-CARTS; James C. Gilbert, Leeds Junction, Maine.

Claim—The arrangement of the backing bearer and engaging notch of the spring-slider, with respect to, and to operate with, the draft hook.

241. ATTACHING CORDS TO WINDOW SASH; Porter A. Gladwin, Bristol, Massachusetts.

Claim—The employment of the slotted tension spring or plate, in combination with the cord and pulley, in the manner described.

242. WINDLASSES; Wm. P. Goolman, Dublin, Indiana.

Claim—1st, In combination with a winding drum or capstan of any suitable form, the application of a reel operated by the traction of the entering cable, to take up the slack from the said drum or capstan. 2d, In combination with the said reel and capstan, the adjustable idle pulley, operating to maintain the needful traction of the cable against the reel, or vary it as may be found needful.

243. PRINTING PRESSES; George P. Gordon, City of New York.

Claim—1st, The combination of one or more sets of revolving grippers with the finger stops, or their equivalents, for the purpose of piling the sheets of paper in an even and regular heap or pile. 2d, The combination of a vibrating feed-board with the rotating or revolving platen, for the purpose of feeding the sheets of paper regularly with precision at each rotation of the platen. 3d, The combination of a rotating reciprocating bed with a revolving platen.

244. BENCH PLANE-STOCK; Jackson Gorham, Bairdstown, Georgia.

Claim—Constructing the plane-stock of a central wooden portion secured between metal side-plates provided with flanches, the part, a′, being permanently secured between the plates, and the part, a, rendered adjustable between said plates by set-screws.

245. COTTON GINS; Edward Gottheil, Galveston, Texas.

Claim—1st, The method of feeding the cotton bolls to the rollers, by means of a blast issuing from a

slotted or perforated tube. 2d, The arrangement of the two cylindrical brushes, in combination with the rollers, when the former are so constructed that a blast from an independent source may be forced through slots or perforations in their peripheries. 3d, The comb, in combination with the blast pipe, for gathering the lint off the upper brush roller and discharging it into its receptacle, in the manner set forth.

246. Surveyors' Chain; Josiah M. Grumman, Brooklyn, New York.

Claim—1st, The method of making civil engineers' and surveyors' chains of a peculiar form of link, as described. 2d, The arrangement of spring-balance and level in the same tube or covering, with the arrangements for adjusting. 3d, The method of allowing for the variation of the temperature by a scale of variation on the chain with the adjusting slide and clamp, so that the chain may be virtually shortened or lengthened to meet the temperature. 4th, The use of the spring catch, by means of which the balance and level is detached from the end link and attached to any other link in the chain at the pleasure of the operator. 5th, The method of attaching the thermometer to the end bar of the chain.

247. Bustles; Isaac W. Hakes, Jr., and A. H. Hakes, Norwich, Connecticut.

Claim—A "bustle," provided with front holding-straps and spring, when otherwise constructed.

248. Cooling and Feeding Material to Mills; B. Q. Harrington and U B. Burris, Missouri City, Missouri.

Claim—1st, The spiral chambers, for the purpose of creating currents of air for keeping the stones cool. 2d, The combination of the spiral buckets with the spiral chambers, when both are arranged in the manner set forth.

249. Chairs for Railroads; Alex. L. Holley, City of New York.

Claim—The combination of the splice and the bracket (the said splice and bracket being either the same piece or separate pieces), with the foot of the rail acting as a tension piece, or with a separate tension piece, in the manner described.

250. Variable Cut-off Gear for Steam Engines; Alex. L. Holley, City of New York.

I disclaim the method described of moving the supplementary valve, the same being in use. I disclaim the use of a supplementary steam piston as the sole mover of a valve.

Claim—Such a combination of the motion of an eccentric, or its equivalent, with the motion of a steam piston for moving a valve, as will effect a variable cut-off of the induction steam, without interfering with a free exhaust, substantially in the manner described.

251. Variable Cut-off Gear for Steam Engines; Bennet Hotchkiss, New Haven, Connecticut.

Claim—The combination of the sliding bar with the sliding collar, when constructed, arranged, and made to control the time of the cut-off by the operation of the governor or regulator only.

252. Corn Shellers; Wm. H. Hovey, Springfield, Massachusetts.

Claim—The arrangement and combination of the endless elevator, the spout, the spring presser, and the shelling cylinder. Also, the arrangement and combination of the grated trough with the elevator and the mechanism for removing the kernels from the cobs, and separating both kernels and cobs, such mechanism consisting mainly of the presser, the shelling cylinder, and the grid or bar. Also, the combination and arrangement of the guide hopper or receiver with the shelling mechanism, the grated trough, and the elevator, in the manner specified.

253. Corn Shellers; James J. Johnston, Alleghany, Pennsylvania.

Claim—The combination and arrangement of the discs or shelling wheels with the guard, guide, and spring or press-plate, constructed in the manner specified.

254. Combined Stump Extractor and Press; George Kenny, Milford, New Hampshire.

Claim—1st, The combination of the main frame, anchor frame, canting frame, with the shaft and the devices for working it. 2d, The main frame and windlass device, in combination with the removable pressing frame and box, as set forth.

255. Apparatus for Drying Shoe-pegs and Grain; Samuel Kimball and Wm. Sawyer, Boxford, Mass.

Claim—The arrangement of the steam pipes with the main cylinder, covered with wire gauze or perforated sheet metal, in whatever manner the steam may be introduced into said pipes, in combination with the floats, constructed and operating in the manner set forth. Also, the arrangement of the steam pipes with the main cylinder, covered with wire gauze or perforated sheet metal, without the floats, constructed and operating in the manner set forth.

256. Pumps; A. C Laning, Wilkesbarre, Pennsylvania.

Claim—The stationary pipe or tube, valve chamber, and reciprocating cylinder, combined and arranged as set forth.

257. Brick Machines; David Locke, Lexington, Missouri.

Claim—The elevated layer of tempered clay, arranged in connexion with the traveling plates or cutters and pressure plates, to operate as set forth.

258. Shingle Machine; H. H. Low, Galena, Illinois.

Claim—Operating the vertically reciprocating and balance frame from the saw or power shaft, through the medium of the pulleys and gearing, arranged with the slide bar, arm, and the springs and spring stop, as set forth.

259. Cob and Grain Mill; John R. Marston, City of New York.

Claim—The set bolt with its nut, or its equivalent, the slot in the shell of the cob-cutter, and the collar on the shaft, for the more practicable and reliable mode of retaining the cutters of the cob mill in their proper places.

260. Egg-beater; James F. Monroe, Fitchburgh, Massachusetts, and E. P. Monroe, City of New York, Assignors to E. P. Monroe, aforesaid.

Claim—The two beaters, constructed of wires and arranged in the adjustable frame, in such a manner that the same, by means of pinions, and by the bevel wheel, receive a rapid rotary motion in opposite directions.

261. Iron Carriage Wheel; John D. Murphy, Baltimore, Maryland.

Claim—A combined wrought and cast iron wheel, when the several parts composing said wheel are constructed in the form, and arranged and combined in the order, as described. Also, having the entire rim of the tread of the wheel open at one place, as shown at d', until after the hub is cast, in combination with the mode of inserting and fastening the spokes in the rim or tread of the wheel.

262. Skates; Isaac W. and Frederick M. Norcross, Lowell, Massachusetts.

Claim—An improved mode of arranging and applying the spring, each being a continuation of the runner, and to extend laterally and longitudinally with reference to, and to be fastened at, the toe and heel of the foot-stand, as specified.

263. Applying Electricity in Dental Operation; Wm. G. Oliver, Buffalo, New York.

Claim—The employment in producing local anesthesia in dental operations, of an apparatus. in which only non-metallic conductors are brought into contact with the parts being operated upon, as set forth.

264. Railroad Car Couplings; George W. Parshall, Middlefield, New York.

Claim—The construction and combination of the head-piece, tongue, wheel, and pin, arranged and operating as described.

265. Snow Ploughs for Railroads; Willard Rhoads, Baltimore, Maryland.

Claim—The projecting flanch, in combination with the vertical sides, in the construction of the railroad track clearers.

266. Sash Cord Fastener; Joseph R. Payson, Covington, Kentucky.

Claim—The cylindrical ring, in combination with the opening, neck, and eye, as described.

267. Weighing Scales; Samuel Pierce, Cambridgeport, Massachusetts.

Claim—The combination and arrangement of the two poise slides and the fulcrum block, in the manner specified.

268. Fluid Measurer; James L. Perry, Mansfield, and Melzer Burt, Norton, Massachusetts.

Claim—The fluid measurer, constructed substantially in manner, and to operate with respect to a barrel or reservoir. as specified—that is to say, as made of a close vessel, induction and eduction faucets, and a telltale valve and valve openings, or equivalent, the valve serving to indicate when the case may be full of liquid, the induction faucet allowing the flowage and interruption thereof of liquid into the case, and the eduction faucets determining the amount of flowage out of the case.

269. Mills for Grinding, Crushing, &c.; Philander Perry, Troy, New York.

Claim—The specified arrangement for effecting the combination, in one machine, of the grinding mill, cob-crusher, corn sheller, and straw cutter.

270. Machines for Making Drain Pipes; Bradford S. Pierce, New Bedford, and Mason K. Pierce, Mansfield, Massachusetts.

Claim—The arrangement of the mixing apparatus, pressing and core-relieving devices above the platform for conveying the moulds, in the manner specified. Also, the arrangement of the core-socket upon the revolving disk to receive the core and the mould, with a provision for discharging the core through the platform.

271. Journal Boxes; Wm. S. Pratt, Brooklyn, New York.

Claim—The rollers, D D, placed between the rollers, C C, in the position and for the purposes specified.

272. Car Couplings; H. Purlier, Jesse Harlan, and E. C. Cheek, Cincinnati, Ohio.

Claim—The employment of the tripping-pin, in combination with the latch-lever, arranged and operating as described.

273. Hydrants; Washburn Race and S. R. C. Mathews, Seneca Falls, New York.

Claim—The combination and arrangement of the parts. consisting of the cap, having within its socket the spring, or its equivalent. stem attachment, interior tube, conical valve, and closed seat, whereby the valve is kept in place by the force of the spring, and operated free from the external pressure of the water.

274. Harvesting Machines; Samuel Ray and Moses R. Shalters, Alliance, Ohio.

Claim—1st, Attaching the finger bar to the machines by means of the plate, one end of which is pivoted to the machine, and the other end connected with the finger bar by joints, the above parts being in connexion with a jointed connecting rod to admit of the folding and turning of the finger bar. 2d, Placing the driver's seat on the springs fitted in the hollow standards.

275. Folding Seat; T. Reeve and M. B. Swezey, Brooklyn, New York.

Claim—The seat, B, attached to the end piece of the pew or settee by the pin of the bar, and the slot in the end piece, and provided with the hinged back and support, arranged as set forth.

276. Machines for Tempering and Moulding Plastic Materials; Silas C. Salisbury, City of New York.

Claim—The employment of a series of two or more cylinders and the intervening guard blocks, in combination with a cylinder of larger diameter provided with flanches on its ends, so that the periphery of the larger cylinder, with its flanches, and the opposing surfaces of the series of cylinders and guard blocks, shall constitute the walls of a channel in which the plastic material, on its passage to the die or mould, is worked, tempered, and pressed, as set forth. Also, giving to the surface of the cylinder a greater velocity than the surface of the large cylinder, for the purposes set forth. Also forcing the plastic material into the die, between the cutting edges, by the pressure of a coat or layer of plastic material, formed on and adhering to the periphery of the large cylinder.

277. Revolving Fire Arms; Jacob Rupertus, Philadelphia, Pennsylvania.

Claim—1st, The safety tube, constructed as specified. 2d, Producing the necessary movements of the safety tube, by means of a forked or toothed lever, spring, or its equivalent, and a tooth on the tumbler, the whole being applied and operating as described.

[A magazine is provided for percussion caps or pellets within the hammer of a fire arm. A feeding slide is applied to the hammer and its contained magazine, which is operated as the hammer falls, causing a cap or pellet to be delivered from the magazine in front of the face of the hammer, and so interposed between the hammer and nipple as to be exploded by being driven by the hammer in contact with the nipple or surface surrounding the vent. There is also a mode of applying and operating a piston to push forward the caps remaining in the magazine after every delivery made by the feeding slide, whereby the inventor is enabled to obtain the greatest length of magazine that the size of the hammer admits of. Half of this patent has been assigned to John Krider and J. T. Siner.]

278. Attaching the Rails of Carriage Seats; Cornelius Scofield, Trumbull, Connecticut.

Claim—The arrangement of the arms, a, the ends of which form half round recesses, in combination with the arms, c, and thumb-screw, for the purpose of supporting the rail and securing the same to the seat, in the manner set forth.

279. STEAM VALVES; C. A. Schultz, City of New York.

Claim—The combined arrangement of the spiral springs and their inclosing columns with the plate, as described.

280. EXCAVATING MACHINES; Charles Schott and James C. Baldwin, Nashville, Tennessee.

Claim—The combination and arrangement of lever with its connexion with bucket, for loading and unloading, in the manner set forth.

281. TEA AND COFFEE POT; J. W. Sener, Fredericksburgh, Virginia.

Claim—The safety apparatus, consisting in the combination of the tube, and the cap, and valve, constructed as specified.

282. STOVES; S. B. Sexton, Baltimore, Maryland.

Claim—The covered fuel cylinder, in combination with the chambers, flues, and dampers, together with the rear casing, constituting a cold air chamber, the arrangement being as set forth.

283. TREATMENT OF INDIA RUBBER; Alexander Shannon, City of New York.

Claim—The method of treating caoutchouc so as to combine therewith cork, or its equivalent, substantially as set forth.

284. INSTRUMENT FOR ASCERTAINING THE DIRECTION OF SOUNDS IN A FOG, &c.; Benj. R. Smith, Philadelphia, Pa.

Claim—A reflector made of suitable material and of such a form or shape that it will collect all the rays ~~or waves~~ of sound entering it to a focus, when pointed towards the direction from whence sound comes, for the purpose of ascertaining the direction of the source of such sound, and conversely of throwing off from the reflector, in parallel lines, if need be, the sound of a bell or whistle, which may be placed at the focus of the said reflector, substantially as described.

285. COAL OIL RETORTS; Wm. Smith, Pittsburgh, Pennsylvania.

Claim—The making of the agitating arms hollow, and to communicate with the hollow shaft, for the purpose of cooling them by means of the current of air or water passing through the said shaft, substantially as set forth.

286. STOVES; Wm. H. Smith, Newport, Rhode Island.

Claim—The arrangement of the partitions, F F′, in combination with the partitions, K, and the openings, for the purpose of forcing the hot air to circulate around and in front of the ash-box, as specified.

287. STOP-COCKS; Erastus Stebbins, Chicopee, Massachusetts.

Claim—The arrangement and combination of the collar, flexible washer, metallic washer, as described. Also, the chambered nut or valve having apertures, as set forth.

288. BRAKE-HEADS FOR RAILROAD CARS; Nathan P. Stephens, Keene, New Hampshire.

Claim—1st, Suspending the brake-heads to the ends of the transverse brake-bar by the journals and boxes. 2d, Forming cogs or protuberances on the peripheries of the journal sleeves, and interposing strips of rubber, between them and the ends of the grooves in the journal box cap, in which the said cogs or protuberances move, for causing a greater pressure to be extended on the lower than on the upper portions of the shoes, as described.

289. EXCAVATING MACHINES; George D. Stillson, Rochester, New York.

Claim—In combination with an endless belt of digging hoes, a presser-wheel, that acts independently of the weight of the machine, for driving them into the ground, as described.

290. GOVERNORS FOR SUGAR MILLS; Robert Stott, Baton Rouge, Louisiana.

Claim—In combination, the caps, the bolts, the plates, when actuated on by the employment of a weight, or its equivalent, through an eccentric movement, when arranged as set forth.

291. WRENCH; George C. Taft, Worcester, New York.

Claim—The rosette with a female screw, in combination with the stationary screw, traversing male screw, and sliding jaw, with its female screw, as set forth.

292. APPARATUS FOR DEEP SEA SOUNDING AND METHOD OF CONVEYING AND PAYING-OUT LINE FOR OTHER PURPOSES; Wm. P. Trowbridge, Washington City, D. C.

Claim—The mode of conveying and extending a line across or through a given space, by means of a weight or projectile, the line being compactly coiled within a tube or case, which is attached to the weight or projectile, and moves along with it, and is discharged from the case or holder as the weight or projectile advances, while one end of the line is retained at the starting point, as described. I do not limit my claim to the particular manner of coiling the line described, or to any one mode of giving motion to the same, which may be the force of gravity, the propelling power of a rocket or cannon, or other motive power.

293. WASHING MACHINE; Michael Van Debogert, Binghampton, New York.

Claim—1st, Subjecting the articles to be washed to the combined action of the fluted or roughened surfaces of the tube and cylinder, the two surfaces moving, in part, in opposite, and in part, in the same direction with each vibration of the cylinder. 2d, The arrangement of the means for gearing and ungearing the wheels, as recited, whereby I am enabled to give vibrating motion to both of the rubbing surfaces, as described.

294. RAILROAD CAR BRAKES; A. P. Tutton, Reading, Pennsylvania.

Claim—Connecting the two shoes between the wheels at each side of the truck, by means of racks and a pinion, whereby the shoes, when brought in contact with the treads of the wheels, are made by the action of the wheels to move simultaneously in opposite directions, and bind or wedge between them the wheels to stop the same, as described.

295. GRATES FOR FURNACES; Richard Van Velthoven, Philadelphia, Pennsylvania.

Claim—The frames with the bars forming the hinged rear of a furnace grate, in combination with the releasing and retaining cam, operated by the rod and the bracket, with its projecting chain, arranged as set forth.

296. HARVESTERS; Jacob V. A. Wemple, Chicago, Illinois.

Claim—The guard rod to separate the falling grain from that which lies on the platform, which the rack is passing down, and lay hold thereof, and also to prevent the grain from falling on the rake, arranged substantially in the manner described.

297. RAILROAD CHAIRS; J. W. Wetmore, Erie, Pennsylvania.

Claim—Notching the caps of the adjacent ends of H or T rails as at f, and the adaptation of a chair to surround the ends or joint within the shoulders of the notches, the chair forming the bearing surfaces for its length, and its leaves being bent under the base of the rail, and resting on the tie, as set forth.

298. MACHINE FOR COMBING FIBROUS MATERIALS; Cullen Whipple, Providence, Rhode Island.

Claim—1st, Arranging the series of gill combs with a hot chest, or its equivalent, in such manner that said combs can be alternately sheathed and protruded from between heated plates, in the manner described. 2d, The combination of the stationary heated chest with the movable jaw, the two so combined operating to hold the fibrous substance firmly while the front end is being combed. 3d, Arranging the series of fine screen combs with the heated chest, in the manner described. 4th, The arrangement and combination of the revolving cylinder for first combing the front end of the sliver, the series of fine screen combs for combing the back end of the sliver, and the nippers for drawing the sliver through the screen combs, and delivering it upon the apron, the whole combination as arranged operating to draw and comb the wool, or other fibrous material, in a straight line, and to deliver it in a position to be formed into a continuous sliver, as described.

299. STEAM BOILERS; Edward Whitely, Boston, Massachusetts.

Claim—The water tubes within the space surrounding the boiler, arranged in the manner set forth.

300. MACHINE FOR SPLITTING FIRE-WOOD; W. L. Williams, City of New York.

Claim—1st, The employment or use of the endless feeding chains, when arranged as shown, or in any suitable way, so as to have the usual rotating movement around their pulleys, and also the lateral movement, for the purpose specified. 2d, The endless feeding chains, in combination with the yielding rollers, for the purpose of permitting the lateral movement of the chains. 3d, The yielding pawls in connexion with the yielding rods, in shafts and spurs, arranged to permit of the yielding of the blocks of wood while being split, as described.

301. DOUBLE SEAMING MACHINE; James Wilson, C. Green, and Wm. Wilson, Jr., Wilmington, Delaware.

Claim—The combination of the discs and the burring pulley, the bearing down pulleys, the double burring pulleys, and the finishing pulley, in the manner described.

302. MACHINE FOR CORRUGATING SHEET METAL; James Wilson, C. Green, and Wm. Wilson, Jr., Wilmington, Delaware.

Claim—The arrangement of the upper and lower heads and the forming rollers, together with the rollers which support the cylinders to be corrugated at the requisite angle, as described.

303. VARIABLE CUT-OFF GEAR FOR STEAM ENGINES; D. A. Woodbury, Rochester, New York.

Claim—The arrangement of the rocker and its variable slide, and the inclined or toggle-like connecting rods, in combination with the eccentric, or its equivalent, and the arms on the valve shafts, as described.

304. MODE OF OPENING AND CLOSING FARM GATES BY HAND; Gilbert Yates, West Dresden, New York.

Claim—The combination of the lever or arms with the connecting arms, vibrating, connecting, and unlatching piece and cords, when arranged and combined with the gate and posts, as set forth.

305. AUTOMATIC FAN; George W. Zeigler, Tiffin, Ohio.

Claim—The combination of the levers, B B, supporting the bedstead with the escapement wheel, F, lever, E, pendulum, and fan, together with the parts connecting the same for operating the fan from the weight of the occupant of the bed.

306. RESTORING WASTE VULCANIZED INDIA RUBBER; F. Baschnazel, Wenham, Assignor to the Beverly Rubber Co., Beverly, Massachusetts.

Claim—The process described—that is, boiling waste vulcanized rubber in water, after it has been reduced to a finely divided state, for the purpose of restoring the same to a plastic, gummy, or elastic state, fit to be used again in the manufacture of india rubber fabrics and substances.

307. HYDRAULIC PRESSES; Thomas Baxter, Assignor to Wm. H. Baxter, Petersburgh, Virginia.

Claim—Making the cylinders of hydraulic presses in a manner described.

308. NEEDLE WRAPPERS; Richard Bennett, Redditch, England, Assignor to J. F. Milward, City of New York; patented in England, May 7, 1857.

Claim—The employment, in combination with the outer wrapper, of an inner wrapper, with an attached piece through which the needles are stuck, in the manner described. Also, the employment, in combination with such inner wrapper, of a loop secured to the outer wrapper, substantially as specified.

309. HOLDING KEYS FOR STRAP CONNEXIONS FOR ENGINES; Truman Cook, Assignor to A. T. Smith, Washington City, D. C.

Claim—The notches in the key, as shown, the hole in the gib, the notch at the side of the said hole, the bolt with its peculiarly formed head, and the combination and arrangement of these parts upon the principle and in the manner set forth.

310. SAW JOINTER; Sherman McLean, Royalton, New York, Assignor to the American Trades Company, City of New York.

Claim—The arrangement and adjustment of the file in the tool or file carrier, so constructed that when the flat side of the long arm of the tool is pressed against the side of the saw blade, it will present the file exactly at right-angles to the angular edges of the teeth, and being passed along over them, will square and make uniform their edges, the saw blade being placed, when the instrument is in use, between the long and short arms of the saw-jointer, as described.

311. MOLE PLOUGH; H. W. Rowland and E. Forbes, Assignors to selves and Washington Witherow, Newport, Ohio.

Claim—Pivoting the carriage to the beam near its forward end, as represented, and in combination therewith, the curved coulter pivoted to the beam and friction rest, all arranged and operating in the manner set forth.

312. CHAMBER OF ORDNANCE AND OTHER FIRE ARMS; John P. Schenkl, Worcester, Assignor to self and E. A. Dana, Boston, Massachusetts.

Claim—The combination of an intercepting rod or leader with the secondary barrel or auxiliary charge chamber, and a projectile adapted to the gun or piece of ordnance.

313. THERMOSTAT FOR STEAM BOILERS; O. M. Stillman and S. Wilcox, Jr., Westerly, Rhode Island.

Claim—Regulating the flow of the products of combustion to the superheater by the difference in pressure between the superheated steam and that of saturated steam, in the manner described.

APRIL 26.

314. STOVES; R. W. Belson, Philadelphia, Pennsylvania.

Claim—The semi-circular heater turning upon the hollow axis near to one side of the heater, arranged and combined with the stove in the manner set forth. Also, combining said heater by means of collar, with the air chamber in rear of the fire-back.

315. STOVES; R. W. Belson, Philadelphia, Pennsylvania.

Claim—The arrangement of the air heater sliding over the oven top and connected with the air passage. Also, making the damper and its shaft hollow.

316. ANIMAL TRAPS; A. S. Blake, Waterbury, Connecticut.

Claim—A trap, having its spring attached below the jaws, and the spring brought within, or nearly within, the diameter of the jaws.

317. SCREW WRENCH; Albert D. Briggs, Springfield, Massachusetts.

Claim—The application of the sleeve to the nut and the handle, so as to not only be capable of turning with and rotating the nut, but of moving longitudinally on the handle and with the nut, in accordance with the movement of the movable jaw on the shank.

318. DISHES FOR WAXING THREAD; George A. Brigham, Marlborough, Massachusetts.

Claim—The combination of the guard, the dripper, and the guides, with the two wires, to be placed in the dish to hold the thread.

319. SUGAR MILLS; John S. Brown and A. C. Greenleaf, Indianapolis, Indiana.

Claim—The combination and arrangement of the rods, levers, and bearings, with the set-screws, when constructed and operated as set forth.

320. STEAM ENGINES; Wm. W. Burgoyne, Washington City, D. C.

Claim—1st, The employment of the following elements in combination, for the accomplishment of the described object, to wit: a water-jacket open to the atmosphere, enclosing the fire chamber, piston chamber, and smoke-stack, a steam evaporating plate forming the crown plate of the fire-box, a supply pump for jetting in the water upon the evaporating plate, and a piston, which is hung or arranged so as to reciprocate in the path of a circle or in a straight line when operated upon by the evaporating steam, and in its movement operate the driving shaft of an engine. 2d, The manner described of making steam between an intensely heated plate, piston, and the isolated or comparatively cool sides of the piston chamber.

321. MARINE GOVERNORS FOR STEAM ENGINES; James L. Cathcart, Georgetown, D. C.

Claim—Regulating the supply of steam to marine steam engines by means of a pendulum, arranged and operated substantially as described.

322. HARVESTING MACHINES; George and W. Chamberlain, Olean, New York.

Claim—The combination and arrangement of the gathering fingers and knives with the reel, arms, receiver, and dischargers.

323. DEVICES FOR STARTING RAILROAD CARS; David Cumming, Sorrel Horse, Pennsylvania.

Claim—1st, In combination with the ratchet wheels and the ratchet bars, arranged as described. 2d, So arranging the ratchet bars with the sliding frame, to which the power is applied, as that said bars will be capable of slight play, up and down, when in clutch with their wheels, and will run entirely out of contact with said wheels without the aid of other mechanism.

324. MODE OF CONNECTING AND SUPPORTING RAILROAD RAILS; M. O. Davidson, City of New York.

Claim—The use of a rail having its lower web cut away for about 15 inches at the ends, in combination with the use of a bridge rail splice, of a form suitable to receive and support securely the stem of the rail after its lower web has been cut away, and of a length of about 30 inches, or of the distance from centre to centre of crop ties at the ends of the rails.

325. COTTON PRESS; Thomas F. de Bruler, Rockport, Indiana.

Claim—The construction and arrangement of the eccentrically operated gear racks with the connecting rod or yoke. Also, the combination of the said devices with the plunger or follower. Also, the construction, and arrangement, and combination of the traversing pinion with the sliding carriage and driving lever or arms.

326. MODE OF CONNECTING STRUNG PEARL JEWELRY; Henry Dubosq, Philadelphia, Pennsylvania.

Claim—Connecting the mother-of-pearl or plates of other material used to form the foundation on which the pearls are strung.

327. LOW WATER ALARM FOR STEAM BOILERS; Selah Dustin, Detroit, Michigan.

Claim—In combination with a steam cylinder located inside of a steam boiler, and having two openings in it, a float and rod carrying or operating two valves in equilibrio, and having no packed joints, by which means I avoid all undue pressure and friction, and render the float more sensitive to any variation of the height of the water in the boiler, and thus obtain a more reliable indication or signal than by any of the heretofore-essayed plans.

328. BREECH-LOADING FIRE ARMS; Willard C. Ellis, Springfield, Massachusetts.

Claim—The cere, having the double action of firing the pistol and unlocking the hook. Also, the lever, in this or any other form substantially the same, in combination with the lugs on the hammer or with lugs on the sides of the pistol frame. Further, the cocking of the pistol by the act of breaking down the barrel, in the manner described.

329. METHOD OF ADJUSTING THE KNIVES OF ROTARY CUTTER HEADS FOR PLANING WOOD; Benaiah Fitts, Worcester, Massachusetts.

Claim—Placing the bolt, or its equivalent, under the knife, to operate or adjust the knives, as described.

330. ROTARY PUMPS; Truman Freeman, Jr., Providence, Rhode Island.

Claim—The combination of the pistons with the dogs, arranged for conjoint operation with the cam and pin, in the manner specified.

331. WASHING MACHINE; Lockwood Gail and John H. Gail, West Falls, New York.

Claim—The arrangement of the vertical post and lever with the rubber.

332. Springs for Railroad Cars and Carriages; Perry G. Gardiner, City of New York.

Claim—The construction of a spring by confining the ends of the exterior blades in bearings in the ends or heads of a tension bar, without rivets, bolts, hinges, pins, or screws.

333. Steam-spading Machines; J. W. Goodell, East Wallingford, Vermont.

Claim—1st, The wheels provided with spades in connexion with the clearers and the rotating plates. 2d, The attaching of the frame which contains the wheels to a traction engine by means of a universal joint, in connexion with the gearing and shaft, whereby the frame and the wheels are allowed to conform to the inequalities of the ground and the working parts driven direct from the engine.

334. Self-acting Apparatus for Working Railway Brakes; Edouard Guerin, Paris, France.

Claim—The forked piece, vertical lever, provided with balance weight, rod, and collar, when arranged as set forth. I reserve to myself the right of varying or changing the forms, dimensions, and proportions of accessories and matters employed.

335. Seeding Machines; Stephen R. Hunter, Cortlandt, New York.

Claim—The seed-distributing cylinder with adjustable shell, in combination with two or more seed-boxes or rotary harrow.

336. Steering Wheel; David Knowlton, Camden, Maine.

Claim—The metal rim or circle provided with sockets for the wooden arms or spokes of the wheels.

337. Ladies' Collar and Cuffs; William E. Lockwood, Philadelphia, Pennsylvania.

Claim—Embossed cuffs, collars, and other articles of wearing apparel, made of a fabric composed of paper and thin muslin, or its equivalent, pasted together as set forth.

338. Water Metre; Nathan B. Marsh, Cincinnati, Ohio.

Claim—1st, The combination of the two side or end measuring chambers, middle piece or stationary cylinders, independent reciprocating interior cylinders, having septums, adjusting rods, and valve box, with its valves and passages, the former actuated by the reciprocating interior cylinders, and the latter forming inlet and outlet communications with and from the measuring chambers. 2d, Supporting the reciprocating interior cylinders on projections formed by the extension inwards of the end flanches of the stationary cylinders, and packing said reciprocating cylinders by the gaskets, which make tight the joints of the stationary cylinders with the measuring chambers, said gaskets being cupped or bent internally.

339. Machine for Corrugating Sheet Metal; Richard Montgomery, City of New York.

Claim—The combination of the bevel wheel and bevel pinions with the sleeve, projections, and fork, with the corrugated rolls, and the device for raising and lowering the corrugated roll, whereby a sheet of metal, once entered between the rolls, can be worked back and forth, and gradually and evenly corrugated at one heat and by one attendant.

340. Mode of Chilling Rims for Locomotive Wheels; Hiram W. Moore, Jersey City, New Jersey.

Claim—The hollow chilled rim, whose inner and outer rims are not only united at the sides or ends thereof, but also united throughout the annulus by means of braces extending from one to the other, for the purpose of strengthening the tread of the wheel and preventing it from cracking or breaking in.

341. Treatment of Vulcanized Rubber; Thomas J. Mayall, Roxbury, Massachusetts.

Claim—The use of olive oil in compositions of gutta-percha and india rubber, in the manner described.

342. Reefing Sails; Enoch E. Mulliner, Camden, New Jersey.

Claim—The combination of the divided sail, with reef pennants, roller clews, pulleys, and yard or boom, as described.

[This invention consists in the arrangement of the lower part of a square or fore-and-aft sail as a bonnet, in combination with a yard or boom, and with proper reef pennants attached to the sail in such a manner that the lower part or bonnet can be reefed or furled to the yard either with or without the upper part of the sail and while connected thereto, and when furled to the yard or boom, can be disconnected from the upper part of the sail to prevent chafing while the upper part remains spread. This improvement applied to the topsails of large ships accomplishes everything that is accomplished by the use of double topsails, while dispensing with the weight of the two extra yards required with such a rig.]

343. Fastening Slats on Sugar Cane Bagasse Carriers, &c.; Charles Neames, New Orleans, Louisiana.

Claim—The arrangement and combination of the two jaws hinged together at L, by means of a hinge pin, as described.

344. Rails for Street Railroads; Samuel Nicolson, Boston, Massachusetts.

Claim—Making each bearer not only with a grooved upper surface, but with a projection or lip at bottom, for the purpose of producing uniformity of strength in the section of the rail and of entering a corresponding groove in the stringer, and supporting the rail and its spikes or bolts against lateral strains.

345. Manufacture of Elastic Belting; S T. Parmalee, Edinburgh, Scotland.

Claim—Submitting the belting, while within the heating or vulcanizing chamber, to pressure between the smooth surfaces of an endless metallic band, and one of two revolving metallic cylinders round which the said band passes.

346. Sharpening the Calks of Horse-shoes; A. W. Payne, Morris, New York.

Claim—The rotary burrs or cutters, one or more, in connexion with the bearing plate or plates, placed within a suitable frame or stock, and arranged as set forth.

347. Water-proof Leather Hose; James Punderford, New Haven, Connecticut.

Claim—Riveted leather hose, made with a water-proof lining applied to its inner surface and extending between the joint or lapping where such rivets are inserted.

348. Machines for Raking Hay; David Rambler, Union Deposit, Pennsylvania.

Claim—The adjustable side bars, provided with the rake-heads, J J, and teeth, in connexion with the rake-head or shaft, B, provided with teeth, and used with or without the dividers, to operate as set forth.

349. Corn Harvesters; Isaac Reamer and Henry Miller, Conrad's Store, Virginia.

Claim—1st, The combination with the vertically adjustable upper guides, of the vertically adjustable reel, for action together. 2d, The reel, constructed with tangentially set tie-bars or guides, in combination with a platform on which the stalks fall parallel with the line of travel. 3d, The combination with the frame,

A, knife, c2, of the under adjustable frame, A'. 4th, The manner of connecting the platform with the frame of the machine, for the purpose set forth. 5th, Providing the platform with a slide back extension board, in the manner set forth. 6th, The arrangement with oblique or diagonal set spring blade or cutter of a fixed obliquely set carrying wheel, in the manner set forth.

350. Stove Polish Mixer and Scraper; John C. Reed, Providence, Rhode Island.

Claim—The combination of the receptacle, scraper, and mixer, when arranged as described.

351. Machine for Laying Hemp around Wire in Making Rope; Jacob Rinek, Easton, Pennsylvania.

Claim—The revolving yoke, with its hollow spindle and one or more rollers, arranged on and turning in the yoke, when the said yoke and its appendages are combined with, and arranged in, respect to the two sets of bobbins containing the strands of hemp, the perforated guide plates, and tube, as set forth.

352. Spring Bed-bottom; Isaac A. Sergeant, Springfield, Ohio.

Claim—1st, The arrangement of the stretcher frame and rails, secured and supported as described. 2d, The supporting legs or stays and racks, in the described combination with the frame. 3d, The described arrangement of straps and knobs.

353. Machine for Addressing Newspapers, &c.; George Shuck, Madison, Indiana.

Claim—The combination with the hopper which contains the documents to be addressed, of the sliding gate provided with a heel or step, and operating to close the hopper discharge, and at intervals to open the same in such manner as to permit of a single document being deposited from the pile in the hopper in front of said heel for after traverse with the gate. Also, the combination of the inclined feeding channel, main type channel, and raised discharge channel. Further, in connexion with the feed bolt, the angle lever, or its equivalent, to aid the type in its course from the feed channel to the main channel of the machine. Likewise, the employment of form boxes, for use as described, at either end of the machine. Also, the combination with the traversing type or form of a notice bell, or its equivalent, for operation by the type at intervals. Likewise, the combination with the bolster, operating essentially as described, of the springs for relieving the type from the paper, and holding it on the bolster and type-shifter. And, lastly, the document-discharging fly, when operated by the sliding gate.

354. Cotton Scrapers; Patrick Sharkey, Brownsville, Mississippi.

Claim—1st, Arranging the scrapers, one forward of the other, on guide blocks or runners of different lengths. 2d, The arrangement of a sleigh-runner shaped gauge with the short scraper.

355. Sewing Machines; Thomas Shaw, Philadelphia, Pennsylvania.

I do not claim, broadly, a needle-bar, to which a vertical as well as a horizontal motion is imparted by cams, or their equivalents—but I

Claim—The feed-bar, attached to and carried solely by the spring, operated vertically by the combined action of the rods and the aforesaid spring, and horizontally by the combined action of the independently adjustable screws and the same spring, and regulated by the screw on the stationary bracket.

356. Governor for Regulating the Speed of Steam Engines; Thomas Silver, Philadelphia, Pennsylvania; patented in England, May 23, 1857.

Claim—The combination of a spring with a momentum wheel and adjustable speed-limiting vanes, the whole constructed with the combination of the peculiarly adjusted sectors, pinion, and links, as described.

357. Detective Register for Doors of Railroad Cars; Walter C. Smith, Georgetown, D. C.

Claim—The opening and closing of car doors by means of the latch or key, in combination with the two index or registering wheels.

358. Gas Pipe Cutter; Joseph E. Stanwood, Malden, Massachusetts.

Claim—My pipe or round rod cutter, as provided with a rotary cutting wheel to operate in conjunction with the claw or pipe-rest. Also, the arrangement of the cutting wheel carrier in a recess formed in the claw block, in combination with the arrangement of the adjustable screws and handle rod, with respect to the said recess and cutter wheel carrier.

359. Spring Car Couplings; Frank Steinhart, Dansville, New York.

Claim—1st, The combination of the radial fenders, or their equivalent, with the jaws of the nippers. 2d, Constructing the bolt head with an open back, and also with a longitudinal recess in its back.

360. Machinery for Accumulating and Transmitting Power; Enos Stevens, Barnet, Vermont.

Claim—The endless chain forming the pendant loops, E and C, supported by the wheels, in combination with the weight suspended from a pulley supported by the loop, E, and the weight or guide pulley, and cord.

361. Pump Boxes; Francis Stock and John Stock, San Jose, California.

Claim—The arrangement of the parts, j, k, l, of the box, in connexion with the bolts or rods and valve, as described.

362. Stop-cocks; Thomas Stubblefield, Columbus, Georgia, Assignor to self and Peter Naylor, City of N. Y.

Claim—The combination of the lever, cap, valve stem, and spring, when the cap is provided with a semicircular opening into which fits the semicircular end of lever, for the purpose of forming a tight joint, without packing.

363. Carpet Fastener; James A. Taylor, Cowlesville, New York.

Claim—The hooks and pins, arranged in combination with the carpet.

364. Wrench; George C. Taft, Worcester, Massachusetts.

Claim—The screw-threaded rosette with its hole, in combination with the stationary guide rod, rack, traversing male screw, and sliding jaw, with its female screw.

365. Grinding Mills; George Todd, St. Louis, Missouri.

Claim—Securing the ears of the rim of the stationary stone between a double series of upper and lower springs, whose elasticity is governed and controlled by the series of adjusting screws.

366. Pen-holders; Alfred R. Turner, Malden, Massachusetts.

Claim—A pen-holder, constructed with the cover turning on a pivot or fulcrum, and acted upon by the bent spring. Also, in combination with the above, the sliding piece, as set forth.

367. Lamp Wicks; John B. Wortendyke, Godwinsville, New Jersey.

Claim—A lamp wick composed of strands that have received a preparatory twist in one direction, are then spun in the contrary direction with and coiled upon a thread, and are then twisted together.

368. Machines for Cutting and Folding Wadding and Paper; John Wood, Brooklyn, New York.

Claim—1st, The receiving box, provided with two compartments and fly-boards, connected with racks and with ratchets, actuated by the arms and cam, in connexion with the wheel and adjustable pinion. 2d, Operating the knife gate and plate, by means of the lever provided with the sector racks, which gear into the racks of gate and bar, so that the knife and plate will be actuated or made to perform their respective functions alternately. 3d, The arrangement of gearing, when used in connexion with the lever, for the purpose of operating the several parts automatically.

369. Refrigerator; Abraham Yost, City of New York.

Claim—The combination and arrangement of compartments, dampers, and escape tubes, as set forth.

370. Construction of Railroads; John Young, West Galway, New York.

Claim—Constructing a rail and saddle, whereby I am enabled to securely hold and render solid the joints or ends of rails during the passage of cars. Also, combining with said rail and saddle, the straining arch, key, and strip, for the purpose set forth.

371. Restoring Waste Rubber; Francis Baschnagel, Wenham, Assignor to the Beverly Rubber Co., Beverly, Massachusetts.

Claim—The process of restoring waste vulcanized rubber by reducing the same, by grinding or otherwise, to a finely divided state, and then submitting the same in a suitable vessel to the direct action of steam.

372. Sofa Bedstead; K. Borren, Assignor to Peter Schneider, City of New York.

Claim—1st, Constructing a sofa bedstead with an interior drawer, which may be pulled and united with the sofa seat, so as to form one bed or couch by the application of ways or grooves to the inside of the sofa frame. 2d, The horizontal rods of the sofa frame, in combination with the stay of the interior drawer, for the purpose of more securely guiding the said drawer. 3d, Providing the drawer with two back pins, in the manner and for the purpose described.

373. Steam Valves; Harry H. Evarts, Assignor to self and Phineas E. Merrihew, Chicago, Illinois.

Claim—The arrangement of the ports, cavities, and passages in the valves, in combination with a corresponding arrangement of the ports in the seat, whereby a single valve is made to perform its functions for the two cylinders of the engines, as set forth.

374. Hinge; Levi T. Howell, Burlington, New Jersey, Assignor to self and De Witt C. Taylor, Philadelphia, Pennsylvania.

Claim—The projection on one-half of the hinge, said projection being inclined on one side and abrupt on the other, in combination with the spring bolt and its notch, when the said bolt is so fitted to the other half of the hinge as to have a limited vertical, but no turning movement therein, and when the whole of the parts are arranged for joint action, as set forth.

375. Horse Power; Clark Lane, Assignor to Owens, Lane, Dyer & Co., Hamilton, Ohio.

Claim—The construction and adaptation of the stay rods with the hooked stand plates and racks on the sweep, or their equivalents, in combination.

376. Regulator for Time-keepers; Ralph S. Mershon, Assignor to self and John M. Harper, Philadelphia, Pennsylvania.

Claim—The application to watches, and such time-pieces as have their vibrations governed by a balance and hair spring, of a compound regulator composed of two or more movable segments, constructed and operating as described. Also, the combination of said compound regulator with a greater or lesser scale, the former fixed and the latter movable, but having a fixed indicator, and capable of being operated either in concert with, or independently of, each other, as described.

377. Seeding Machines; George W. Richardson, Grayville, Assignor to self and John P. Williams, White County, Illinois.

Claim—The arrangement of the cam wheel and lever with the seed slide and vibratory bar of the harrow, when the whole are constructed as set forth.

378. Joint for Gas and Water Pipes; James E. Quinn, Assignor to John M. Johnston, Chicago, Illinois.

Claim—The arrangement of the rings on pipe, in combination with the opening in the socket forming the cement chamber, for the purpose of joining pipes air and water-tight, by using cements in place of lead commonly used.

[The invention consists in providing a groove and shoulder at the junction of two sections of pipe or tubing for receiving and confining the cement. The cement is poured into this groove, and against the shoulder, from the outside of the pipe; and when the groove and the hole through which the cement is poured are filled, it is impossible almost to open the joint, and the cement is kept from exposure to the moisture. The use of lead solder is wholly dispensed with.]

379. Bed-bottom; Leonard B. Tinkham, Assignor to self and Charles Ryan, Lawrence, Massachusetts.

Claim—The combination of S-formed springs, arranged so as to receive the movable rivet and retain the slats in place, with bars and stirrups.

380. Egg-beater; John L. Nicolai, Assignor to self, S. E. Knott, and R. F. Farrell, Chicago, Illinois.

Claim—1st, The beaters, arranged with diverging fingers, which are attached to discs, to operate as set forth. 2d, The arrangement of a series of beaters on rotary shafts, so that the several beaters can be operated, as specified.

Extensions.

1. Wooden Bridges; George W. Thayer, Springfield, Massachusetts; patented April 22, 1845; extended April 26, 1859.

Claim—The combination of one or more series of iron screw rods with the suspension posts and cords or string pieces of a truss, in the manner specified. I do not claim the combining with the posts, braces, and strings of a truss, a series of supplementary braces. But I claim the arrangement of such a series of braces upon the outer sides of the truss, and so that they shall extend above and below the cords thereof, and be confined to the truss, as described.

2. Machines for Making Match Splints and Arranging them in the Dipping Frames; Asa Fessenden, Templeton, and Luke S. Knight, Barre, Mass.; patented April 26, 1845; extended April 26, 1859.

Claim—The combination with the series of cutters of the passages leading from the cutters, whether

there be one or more series of said cutters and passages. Also, the combination with the aforesaid cutters and passages of one or more dipping frames, arranged and operating with respect to them, as described. Also, the manner of making the dipping frames in sections of separate pieces or plates. Also, the combination of mechanism by which each of the blocks of wood is held down upon the carriage, and progressively forced forward against the board, the said mechanism being applied to the carriage and board. Also, the combination of machinery by which the dipping frames are progressively moved forward, the said machinery being connected with, and intervening between, the carriage and the said dipping frames.

Additional Improvements.

1. Seeding Machines; Charles Cox James, Dayton, Ohio; patented December 15, 1857; additional dated April 5, 1859.

Claim—The arrangement of the stationary roof-like screen, lateral sloping projections, septem, slides, slotted bars, and shoes, with slide and trough; constructed as described, and used in combination with the features covered by my patent of December 15, 1857.

2. Arithmometer for Addition; Orlando L. Castle, Upper Alton, Illinois; patented November 2, 1858; additional dated April 19, 1859.

I do not claim the use of any particular kind or arrangement of keys. But I

Claim—The combination of the rocker keys and shifting pawl, in any equivalent manner, and for the purposes set forth.

3. Machine for Dressing Mill-stones; Simon W. and R. M. Draper, South Dedham, Mass.; patented May 13, 1856; additional dated April 19, 1859.

Claim—The bed-piece with the cam, bar or lever, and rods, attached, provided with springs, in combination with the frame or carriage, with pick shaft attached, provided with the forked arm, arranged to operate as set forth.

4. Machine for Packing Wool; Charles Carlisle, Woodstock, Vermont; patented October 6, 1857; additional dated April 26, 1859.

Claim—Forming either or both of the leaves of two or more connected longitudinal sections, when the said jointed leaves are so arranged as to operate with the other parts of said machine, in the manner set forth.

5. Corn Shellers; Wm. Wells, Boston, Massachusetts; patented January 4, 1859; additional dated April 26, 1859.

Claim—The guide, in combination with the weighted or spring presser, made movable and adjustable with reference to the centre of the disc.

Re-Issues.

1. Making Illuminating Gas; N. Aubin, Albany, New York; patented January 8, 1856; re-issued April 5, 1859.

Claim—The described process of making gas for heating or illumination, which consists—1st, In mixing materials substantially such as are specified. 2d, In introducing them into a chamber, substantially such as described, located when the process is going on within retort. 3d, In causing the products of distillation of the mixture to pass out of such interior chamber, and then be subjected to a higher degree of heat by passing in contact with the heated surface of the retort itself, substantially as specified, not intending to claim any one step of the process separately, but only the process, substantially as set forth, as a whole.

2. Gas Generators; N. Aubin, Albany, New York; patented Jan. 8, 1856; re-issued April 5, 1859.

Claim—The combination with a gas retort of a removable interior chamber open at bottom, and having such relative shape with regard to the retort, and so located therein, substantially as is specified, and for the purposes set forth; and this I claim irrespective of the location of the opening through which said removable chamber can be introduced or withdrawn, and either with or without an apparatus for introducing steam into the retort.

3. Tight Joints for Gas Retorts; N. Aubin, Albany, New York; patented January 8, 1856; re-issued April 5, 1859.

Claim—A joint between a gas retort and its cover made by fusible metal contained in a groove into which enters a rim, the joint being such and for the purposes set forth.

4. Tubular Elastic Valve; Franklin Peale, Philadelphia, Pennsylvania; patented June 26, 1856; re-issued April 5, 1859.

Claim—1st, The flexible valves described, for the purposes specified. 2d, The method described of adapting the flexible valves to pumps, or other tubes of any kind, whether rigid or elastic, and inserting them therein, in the manner set forth, or in any equivalent mode.

5. Spring Bed-bottom; Hiram Tucker, Cambridgeport, Massachusetts; patented July 3, 1855; improvement added July 9, 1857; re-issued April 5, 1859.

Claim—The described spring bed-bottom, consisting of the combination of the frame, slats, and radial springs, as described.

6. Machinery for Making Wood Screws, &c.; Cullen Whipple, Providence, Rhode Island; Assignor to the New England Screw Company; patented December 7, 1852; ante-dated June 7, 1852; re-issued April 12, 1859.

Claim—In combination with a mandrel which carries chuck or griping jaws, an automatic mechanism for closing said jaws upon the blank, keeping them closed to hold the blank while being dressed, and then opening them to release the dressed blank, arranged and operating in such manner as to leave the mandrel (during the time that the blank is being acted on by the cutter,) free from endwise pressure by the chucking mechanism. Also, in combination of toggle levers carried by the mandrel, a stop or hold-fast, also carried by the mandrel, to lock and hold the toggle levers when pushed beyond a straight line, and griping jaws with shanks having sufficient elasticity to maintain a firm hold of the jaws upon the blank, when the toggle levers have passed a straight line.

7. Machinery for Making Wood Screws, &c.; Cullen Whipple, Providence, Rhode Island, Assignor to the New England Screw Company; patented December 7, 1852; ante-dated June 7, 1852; re-issued April 12, 1859.

Claim—A feeding punch and mechanism for causing it to approach within different distances of the griping

jaws adapted to receiving and holding screw blanks in variable positions and of different lengths, in combination with a suitable tool-holder and cutting tool.

8. Machinery for Making Wood Screws, &c.; Cullen Whipple, Providence, Rhode Island, Assignor to the New England Screw Company; patented December 7, 1852; ante-dated June 7, 1852; re-issued April 12, 1859.

Claim—The spring discharging punch, in combination with the mandrel and griping jaws, when the punch and spring are both carried by the mandrel.

9. Machinery for Making Wood Screws, &c.; Cullen Whipple, Providence, Rhode Island, Assignor to the New England Screw Company; patented December 7, 1852; ante-dated June 7, 1852; re-issued April 12, 1859.

Claim—1st, The feeder composed of a sectional trough with a close bottom and open top, into which the blank drops and arranges itself before a traversing rod, which pushes it into the griping jaws. 2d, The combination of an adjustable automatic feeding punch and a spring-discharging punch, with an intermediate trough, or equivalent means for bringing the blank into line with two punches. 3d, The arrangement of a spring-discharging punch, with its end far enough within the end of the grooves in the griping jaws to leave an opening for admitting the end of a blank and guiding it against the end of the discharging-punch, thereby rendering the checking more certain.

10. Printing Presses; George P. Gordon, City of New York; patented July 13, 1858; re-issued April 12, 1859.

Claim—1st, The combination and arrangement of the feed-table, the fly or pile-board, the platen and bed, with the set or sets of independent revolving nippers or grippers, for the purposes described. 2d, The fly-board with its adjustable gauge or guide, in combination with the grippers or nippers to ensure the even piling of the sheets of paper, or their equivalents, whatever the size of the sheet may be. 3d, The vibrating double cam for throwing off and on the impression. 4th, Two or more distributing rollers, having a lateral motion upon a main distributor, which shall move independent of, and in opposite directions to, each other, and thus alternately cross and re-cross each other's distribution, for the purpose of giving a uniform inking to the form. Also, the two distributions given to the inking rollers upon one cylinder, for each impression (heretofore patented by me), in combination with the rotating reciprocating bed, with the spring extension attached.

11. Automatic Grippers for Carrying Sheets of Paper in Printing Presses; George P. Gordon, City of New York; patented July 13, 1858; re-issued April 12, 1859.

Claim—1st, One or more sets of grippers, nippers, or fingers to revolve independent in themselves upon an axis, for the purpose of carrying the sheets of paper to the place of impression, or for carrying the sheet, after it has received an impression, to its place of deposit upon the pile-board or fly-board, or for either or both of these purposes, thus receiving and piling the sheets of paper in an even and regular heap, by the acts of my automatic grippers or independent revolving nippers, or their equivalents. 2d, The combination of the independent revolving grippers with the vibrating feed-board, or its equivalent. 3d, The combination of the independent revolving grippers with a pile or fly-board, to be used as described, or in some equivalent way. 4th, The combination of the independent revolving grippers with a feed-board and a pile or fly-board, or their equivalents.

12. Harvesters; Thomas D. Burrall, Geneva, New York; patented March 18, 1856; re-issued April 12, 1859.

Claim—1st, The shoe-piece and racks to adjust the height of the outer end of the finger-board. 2d, The shaft, f, passing across the end of, and nearly at right angles to, the shaft, 1, of the main wheel, when fitted in such a manner that its pinion can be thrown into and out of gear with the face wheel.

13. Coffee-roasters; Theodore Heermans, Mitchelsville, Tennessee; patented January 18, 1859; re-issued April 12, 1859.

Claim—1st, The specified arrangement of the plates or shelves. 2d, The combination of a window or windows in a coffee-roaster, with agitating or elevating plates or shelves.

14. Grain and Grass Harvesters; E. B. Forbush, Buffalo, New York; patented July 20, 1852; re-issued July 8, 1856; re-re-issued April 19, 1859.

Claim—1st, The device for adjusting the cutting apparatus, which may be raised or lowered without changing the height of the main frame, in combination with the finger bar either with or without the removable platform. 2d, The combination of the inner projecting ends of the main frame with the adjustable cutting apparatus. 3d, Supporting the clamp and finger bar by means of the slotted iron frames and locking bolts, in combination with the cross-pieces of the main frame. 4th, The mould-board, constructed and arranged in the manner set forth. 5th, Extending or widening out the upper part of the guard finger by the overhanging bars, in combination with the central bar, in the manner specified. 6th, Arranging the three-pronged fingers, above described, so that they mutually brace each other in front of the finger bar, and are also braced and supported at each end of the cutter bar by the projections, in the manner specified. 7th, The raking apparatus, constructed and operating in the manner described. 8th, The movable fulcrum upon which the rake is suspended, and operated in the manner described.

15. Grain and Grass Harvesters; E. B. Forbush, Buffalo, New York; patented March 18, 1856; re-issued April 19, 1859.

Claim—1st, The manner of constructing and uniting the inner rear corner of the main frame, so as to depress or drop the shoe and cutting apparatus, and serve as a continuation of the shoe for treading down the stubble and mown grass, in the manner specified. 2d, The combination of the guide stirrup with the front of the main frame, so as to permit the draft-pole to play above and below the front of the main frame. 3d, Connecting the draft-pole to the machine by the oscillating pendent. 4th, So connecting the draft-pole to the machine, as that the draft shall be from the axle or centre line of the driving and supporting wheel, in connexion with the rear extension of the pole, in the manner specified. 5th, The combination of the extended finger bar with the adjusting shoe and adjustable hinged runner, as described. 6th, The combination of the main frame, draft-pole, guide stirrup, and adjustable shoe, arranged with each other in the manner specified. 7th, The adjusting shoe, constructed and operating in the manner set forth. 8th, The arrangement of the caster wheels with adjustable connecting bars in relation to the finger bar, platform, and frames of the machine, in the manner described.

16. Washing Machine; H. E. Smith, Philadelphia, Pennsylvania; patented October 26, 1858; re-issued April 19, 1859.

Claim—1st, The vessel with its yielding valved diaphragm and the perforated diaphragm, or its equivalent, in combination with a pipe, G, communicating with the vessel at a point above, and the pipe, H, at a point

below the said diaphragm, and both pipes communicating with any suitable heating apparatus. 2d, The reciprocating plunger with its enlarged end constructed with the recess, flanch, and perforations, in combination with the yielding diaphragm, for the purposes specified. 3d, Providing the plunger with an upper enlargement concave on the under side, and arranged in respect to the lower plunger, substantially as set forth.

17. Grain Harvesters; Thomas D. Burrall, Geneva, New York; patented April 5, 1853; re-issued April 26, 1859.

Claim—The additional apron to convert the usual rear discharge into a side discharge of the cut grain. Also, the combination of the curved supports and the adjustable journal box piece to preserve the relative positions of the cogs in the mitre gearing, and at the same time allow of raising and depressing the driving wheel. Also, the notches in the back corners of each knife to prevent clogging or lodgment of fine grass in the cavities of the guards, said notches effecting a good purpose and not weakening the cutter.

18. Grain Harvesters; Thomas D. Burrall, Geneva, New York; patented April 5, 1853; re-issued April 26, 1859.

Claim—The location of the raker's seat with regard to the drive-wheel and platform. Also, in combination with a raker's seat, located as described, extending the rear of the platform far enough back to allow the raker from his seat to turn the grain upon the platform, and rake it off in an arc of a circle by a circular sweep or quarter turn movement of his rake.

19. Arrangement of Buckets of Paddle-wheels; Mathew A. Crooker, City of New York; patented Oct. 28, 1856; re-issued April 26, 1859.

Claim—Arranging the floats or buckets of a paddle-wheel upon its arms, or the equivalent thereof, whereby the buckets shall be continuously increasing and diminishing their depth in the water as the said wheel revolves.

20. Machines for Pegging Boots and Shoes; John James Greenough, City of New York; patented Jan. 17, 1854; re-issued July 4, 1854; re-re-issued April 26, 1859.

Claim—Driving the pegs into boots and shoes automatically, by means of a peg-driver operated up and down by a positive mechanical movement, whether impelled by a cam, eccentric, or crank, or other equivalent, substantially as specified.

21. Machines for Pegging Boots and Shoes; John James Greenough, City of New York; patented Jan. 17, 1854; re-issued July 4, 1854; re-re-issued April 26, 1859.

Claim—The moving of the sole of the shoe along by means of the awl that forms the hole in which the peg is inserted, in combination with the peg-driver, whether the peg-driver be or be not employed to perform the additional function of presenting the peg, whereby each hole made by the awl is brought in succession in line for inserting the peg before the awl is withdrawn.

22. Machines for Pegging Boots and Shoes; John James Greenough, City of New York; patented Jan. 17, 1854; re-issued July 4, 1854; re-re-issued April 26, 1859.

Claim—Cutting off shoe pegs from a strip of peg wood, or other material, by means of a lateral or side cut, that will cut straight across, when combined with suitable ways in which the strip slides, and machinery for driving the pegs. Also, inclosing the peg by the cutter until it is driven, as specified, by making the cutter, when in position, a part of the guiding tube. Also, the combination of the endless feed with a cutter for severing the pegs in a shoe-pegging machine, as specified.

23. Machines for Pegging Boots and Shoes; John James Greenough, City of New York; patented Jan. 17, 1854; re-issued July 4, 1854; re-re-issued April 26, 1859.

Claim—Connecting the last with a horizontal slide or plate capable of presenting the shoe or boot, so that the shoe or boot attached thereto may be turned and moved in any direction, in a horizontal or inclined course, in combination with a mechanism which tends constantly to force it upward against a rest or guide, but which will permit it to yield downward, but this combination I claim only when combined with the pegging mechanism described, or any equivalent therefor. And I also claim as an automatic means of moving and guiding the last to present it to the pegging apparatus, in the required line of pegging, the guide groove, guide, and pinion, and curved neck, substantially as described, in combination with the mechanism above described, or the equivalent thereof, which permit the last to be moved in any desired direction, as set forth.

24. Machines for Pegging Boots and Shoes; John James Greenough, City of New York; patented Jan. 17, 1854; re-issued July 4, 1854; re-re-issued April 26, 1859.

Claim—The combination of the universal movement carriage and lateral awl movement, for properly presenting the shoe to receive the pegs in succession. Also, the combination of the mechanism for the cutting and feeding of the pegs, or any equivalent therefor, with the automatic peg-driver. Also, the combination of the following elements, or their mechanical equivalents, namely, the peg-former, the peg-feeder, the peg-driver, and the mechanism for moving the shoe, described, thus constituting an automatic machine for pegging shoes.

25. Machines for Pegging Boots and Shoes; John James Greenough, City of New York; patented Jan. 17, 1854; re-issued July 4, 1854; re-re-issued April 26, 1859.

Claim—The pegging of boots and shoes with nails or pegs of drawn wire. Also, driving the pegs by means of the cutting nippers, said nippers cutting off the peg after it is driven, substantially as specified.

26. Tailors' Shears; Rochus Heinisch, Newark, New Jersey; patented July 13, 1858; re-issued April 26 1859.

Claim—The oblique rectilinear slot in the elongated shank of the lower blade, in combination with the fulcrum and a lever connecting with two portions of the shears behind the fulcrum.

27. Machine for Making Paper Bags and Envelopes; North American Paper Bag and Envelope Manufacturing Co., Philadelphia, Pennsylvania, Assignees of J. A. Smith, Clinton, and S. E. Pettee, Roxborough, Massachusetts; patented May 1, 1855; re-issued April 26, 1859.

Claim—1st, The bar to relieve the end of the under sheet of the weights of the pile, partially or wholly. 2d, The friction bar to separate the under sheet. 3d, The guide bar in connexion with the bar. 4th, The lifter, to relieve the sheet from the weight of the pile. 5th, The feeding from the bottom of the pile. 6th, The combination of the weight bar, friction bar, guide bar, and lifter, constituting a feeding apparatus. 7th, The jaws to place the paper in position. 8th, In combination with machinery for making bags from paper of any size, we claim a former of the shape and dimensions required by the nature of the work to be done, over or around which the paper is to be folded, for the purpose of producing the bag or bags. 9th, The pasters and side folders. 10th, The combination of the table, the bar, the side folders, and pasters, all constructed as set forth.

28. Sewing Machines; Emeline M. Stedman, Vienna, New Jersey, Executrix of George W. Stedman, deceased; patented December 12, 1854; re-issued April 26, 1859.

Claim—1st, The tube described, receiving thread in the manner specified, and acting in combination with the needle, so that each forms a series of loops, each of which loops receives one and is received by the next one of the other series. 2d, The auxiliary plate carrying the guide for the looping tube, and secured to the bed-plate, so as to be adjustable to any desired position relatively with the needle. 3d, A reciprocating tube, or equivalent device, co-operating with an eye-pointed needle to concatenate or form the stitch, and produce sewing essentially as specified, combining with and receiving its motion from one end of a lever, the fulcrum of which is at or near the bed or table of the machine, while the other end carries the said needle. 4th, Feeding the cloth by means of a needle which is made to pass through the same in a position with respect to its length, diagonal to its line of movement, in combination with a spring to throw the needle into position to feed the cloth the next stitch, and the screw, or its equivalent, to determine and regulate the length of the stitch.

29. Grain and Grass Harvesters; Eliakim B. Forbush, Buffalo, New York; patented April 17, 1855; re-issued April 26, 1859.

Claim—1st, The arrangement and connexion of the rear cross-timber in relation to the main frame, in the manner specified. 2d, The peculiar construction and arrangement of the gear frame in relation to the main frame, driving wheel, and gearing. 3d, The gear key, in combination with the gearing shaft. 4th, The locks in the clamp. 5th, The track clearer, provided with the arms, arranged in relation to each other, and socket-piece, to operate in the manner described. 6th, A recess made in the outside shoe, in the rear of the outside cutter bar. 7th, The second angle at c r, formed by the brace bars of the guard finger.

Designs.

1. Floor Cloth; James Patterson, Elizabeth, New Jersey; dated April 5, 1859.
2. Plates for Cooking Stoves; S. H. Ransom, Albany, New York; dated April 5, 1859.
3. Plates for Stoves; S. H. Ransom, Albany, New York; dated April 5, 1859.
4. Stoves; Garrettson Smith and Henry Brown, Philadelphia, Pennsylvania, Assignors to Hayward, Bartlett & Co., Baltimore, Maryland; dated April 12, 1859.
5. Stoves; G. Smith and H. Brown, Assignors to North, Chase & North, Philadelphia, Pennsylvania; dated April 19, 1859.
6. Cook Stoves; Sherman S. Jewitt and Francis H. Root, Buffalo, New York; dated April 26, 1859.
7. Tea-pot, &c.; G. W. Smith, Hartford, Connecticut; dated April 26, 1859.

MAY 3.

1. Manufacture of White Lead; Fanning Albert, Brooklyn, New York.

Claim—The application of a rotating self-feeding cylinder for the drying of wet carbonate of lead.

2. Alarm Water Gauge; W. R. Andrews and John Oswald, Chicago, Illinois.

Claim—The disc valve, its stem and spring, applied in combination with the enclosing sockets, F and G, the latter of which contains an annular passage communicating with a whistle.

3. Faucets; Silas Barker, Hartford, Connecticut.

Claim—The vertical discharging orifice and the concave end cut-off to the face slide, in the manner set forth.

4. Elevators; Albert Betteley, Boston, Massachusetts.

Claim—1st, The combination of the air reservoir with the movable car or platform of an elevator. 2d, Constructing the base of the car in the parachute form.

5. Door Spring; Amos S. Blake, Waterbury, Connecticut.

Claim—The arrangement and combination of the spring, links, and arms.

6. Manufacture of Watch Cases; James Boss, Philadelphia, Pennsylvania.

Claim—1st, Spinning-up of watch cases by the employment of a mandrel and spinning wheels, constructed in the manner set forth. 2d, Spun plated sheet metal watch cases, constructed as specified.

7. Fastening for Curtains of Carriages, &c.; Wm. Z. W. Chapman, City of New York.

Claim—A curtain knob fastening, constructed so as to be readily opened from the base or on either side of the curtain.

8. Skate Fastening; Chandler Cheney, Milford, Massachusetts.

Claim—Securing the back part of the skate to the boot or shoe, by means of the spring band in connexion with the screws, or their equivalents, in the manner described.

9. Sewing Machines; D. W. Clark, Bridgeport, Connecticut.

Claim—As an improvement on my patent of August 31, 1858, the combination and arrangement of mechanism for the purpose of controlling the feed wheel, in the manner set forth.

10. Water Cask Life-boat; Wm. N. Clark, Chester, Connecticut.

Claim—1st, Making the staves upon the lower side of the water cask more curved than those are upon the upper side, in order to give the life-boat a proper bearing and greater stability in the water. 2d, The ballast floor, water tank, and batch, when they are used in connexion with the water cask and life-boat.

11. Smoke-stack for Locomotive Engine Houses; Henry Clayton, Tamaque, Pennsylvania.

Claim—The arrangement and combination with the smoke pipes of locomotive engines of a sliding tube, flue, and stack, as described.

[A series of flues communicate with a common stack at the centre of the building, the flues being provided each with a sliding or adjustable cap and tube, so arranged that each cap may be lowered over the top of a smoke pipe of a locomotive to convey the smoke therefrom into the stack, the tubes of the caps acting as valves as well as means of communication with the stack, so that when the caps are raised the flue of each elevated cap will be cut off below with the external air, and thereby prevented from injuring the draft of any of the flues in use.]

12. Skate Fastening; John H. Coe and Wm. B. Sniffen, Stratford, Connecticut.

Claim—1st, The employment of the curved adjustable slotted bars at the front of the foot or base plate, combined in relation to each other and secured together and to the said base or foot-plate, in position to correspond with the length of the foot and form of the front part of the same. 2d, The combination of the right and left screw and the clamps, with the heel part of the skate frame, so that both clamps are simultaneously moved. 3d, The combination of a hinged handle with the screw which operates the clamps, so that after the skate is fastened to the foot, the handle may be folded out of the way of the ice.

13. Bomb Lance; Paschel B. Comins, San Francisco, California.

Claim—The employment of wings formed of a flexible material in connexion with metal springs, when so arranged as to be folded on the cylinder (for containing the powder), between the head and wad, in the manner set forth.

14. Apparatus for Generating Gas; Mathias P. Coons, Brooklyn, New York.

Claim—The form and mode of arrangement of the retorts, as specified. for the purpose of combining a series of gas-generating retorts, as combined, for extending or diminishing its capacity of generating gas indefinitely. Also, the combination of a diaphragm surrounding a condensing chamber and escape pipe.

15. Cooking Stoves; Joseph Cox, Philadelphia, Pennsylvania.

Claim—The chamber above the top oven plate, communicating with the external air and fire chamber, whereby there is effected the double function of aiding combustion and equalizing the temperature of the upper portion of the oven.

16. Variable Cut-off for Steam Engines; Alexander Crumbie and Russell D. Briggs, Brooklyn, New York.

Claim—The arrangement and combination of the toggle rods, slide, rockers, stems, and lifters, as described.

17. Tobacco Press; Edward and Wm. B. Cunningham, Powhatan Court House, Virginia.

Claim—Producing an improved hand press which is especially calculated to aid in compressing bunches of leaf tobacco into the proper shape for packing or "prizing;" the said press being composed of a narrow open box which has a fulcrum piece and a false bottom combined therewith, and a removable lever adapted thereto.

18. Lamps; Michael A. Dietz, Brooklyn, New York.

Claim—Securing or connecting the deflector to and into the chimney band by means of a groove, as described.

19. Lock for Piano-fortes; P. F. Dodge, West Cambridge, Massachusetts.

Claim—Actuating the bolt by means of the arm, of the tumbler, and the recess in the bolt.

20. Piano-fortes; Spencer B. Driggs, City of New York.

Claim—So arranging and applying the sound board and strings, and so constructing and applying the bridge or bridges of a piano-forte, that the depths of the bridge or bridges at the bearing points of the several strings, and the distances of the several strings from the board, are all in the same proportion, or thereabouts, to the length of string.

21. Machine for Filing Gin Saws; James W. Elliott, Prattville, Alabama.

Claim—1st, Making said table adjustable at both ends. 2d, The standard, with the adjustable post and slotted bar for supporting the cylinder of saws. 3d, Making the way adjustable, both perpendicularly and laterally, for bringing the frame to any desired position. 4th, The use of the clamp screw, in combination with the way for holding the frame in position. 5th, A pawl held in place by the coiled spring and operated by the connecting rod, rock shaft, and levers or arms for rotating the saws. 6th, The friction plates for holding and moving the saws, said plates being arranged as described. 7th, The adjustability of the guides, for the purpose of pressing the files more or less against the saws, at pleasure.

22. Forming Curved Electrotype Plates; Wm. H. Elliott, Plattsburg, New York.

Claim—1st, The employment of ledges, in combination with the form, for the purpose of holding a compound flexible impression sheet or type matrix in the required form, with or without screws. 2d, The employment of curved edges, in combination with the form, when said edges are so arranged in relation to said form that the edges of the compound impression sheet shall be held firmly between them, for the purpose of holding said impression sheet or type matrix in a cylindrical form. 3d, The employment of air escapes, in combination with form, box, and the flexible impression sheet, so as to provide for the escape of air from between the said impression sheet and form. 4th, The combination and arrangement of the concave form with the adjustable wires, for the purpose of holding the impression sheet in contact with the concave side of said form. 5th, The employment of a curved impression sheet of sufficient elasticity that it may be straightened out while the matrix is being formed by the type, and then spring up again by its own power to the form required, in combination with the curved form, when used for the construction of a curved type matrix.

23. Shingle Machine; Wm. Kirkpatrick, Lancaster, Pennsylvania.

Claim—1st, The added plate, constructed as described, and when acting in combination with the wrought iron piece and spring. 2d, The guide piece, as arranged and for the purpose specified. 3d, The combination of the rod with the pieces, g g and a a, by means of which the frow is enabled to accommodate itself to the winding grain of the timber.

24. Handle for Cutlery; J. W. Gardner, Shelburne Falls, Massachusetts.

Claim—Attaching the handle to the knife, or other implements or tool, by means of a tang provided with a cylindrical projection and bolsters, the tang and projections being fitted in a longitudinal kerf or cut and hole in the handle, the bolster bearing on the end thereof, and the tang secured in the handle by a rivet.

25. Machine for Cleaning Grain; T. G. Gleason, Rochester, New York.

Claim—The arrangement of the screens, vibrating longitudinally with the fan, removable apron, and detachable smut cleaner.

26. Valve Gear for Steam Engines; Thomas Hawkins, Mobile, Alabama.

Claim—The combination of the bearing and suspending plates, one on the toe and the other on the lifter, with a self-acting (or pendulum) catch for the purpose of holding open the steam valve to any desired point of the stroke.

27. Wheelwrights' Machine; T. L. Hawkins, Sturgeon, Missouri.

Claim—The arrangement of the several parts, as described.

28. Ladies' Hoop Skirts; John Holmes, Boston, Massachusetts.

Claim—1st, Constructing a skirt of "knotted" or "network," and this I claim whether the meshes on the front and back of the skirt are alike or not. 2d, Enlarging the rear upper portion of a skirt, formed by a series of meshes to form the bishop shape, by increasing the relative size or number of meshes on the rear upper portion thereof, as compared with those in the same course on the front of the skirt. 3d, The horizontal bustle-supporting spring, in combination with the compressed tape and the upper part of the skirt. 4th, The combination of the "netted skirt" with the hoops, spring, compressing tape, and waistband.

29. Hair Crimper; Ellwood Ivins, Waterbury, Connecticut.

Claim—A hair crimp, composed of a fork and clasp, made as described.

30. Egg-beater; S. F. Jones, St. Paul, Indiana.

Claim—An egg-beater having a cup, shaft, strap, tube, slotted bar, cords, attached to shaft, and to adjusting screws in bar.

31. Skates; Uriel Josephs, Quincy, Massachusetts.

Claim—1st, The combination of the braces or struts with the plates, either with or without the screw. 2d, The combination of the bar with the runner.

32. Measuring Faucets; Ira Kinman, Freeport, Illinois.

Claim—1st, The employment of an endless screw, or its equivalent, in combination with the rotating slide and eccentric chamber. 2d, The register wheel and index hand, in combination with the stop, when the same is operated by the stem of the endless screw, so as to indicate the quantity of liquor drawn through the faucet.

33. Windlass; David Knowton, Camden, Maine.

Claim—The winch shaft provided with barrels and connected to the windlass by gears, and so arranged that the windlass may be worked by the winch shaft, or the winch shaft and barrels may be worked independent of the windlass.

34. Steam Boilers; L. Lefebre, Donaldsonville, Louisiana.

Claim—The longitudinally fluted boiler, braced as described, in combination with the conformable under surface of the exterior flue.

35. Pumps; A. W. Lloyd, Otis, Massachusetts.

Claim—The arrangement and combination of the side tube, pipe, valve, and piston, as described.

[The invention consists in the use of a hollow piston, provided with a valve and fitted within a proper cylinder, an air-chamber being connected with the cylinder, and also a side water passage.]

36. Grinding Mills; J. C. Lyons, Auburn, and H. F. Philips, Seneca Falls, New York.

Claim—The described arrangement and combination of the grinding cone and the corn cracker, when the former is arranged on a shaft which receives a longitudinal motion by means of a hand wheel, and from which motion is conveyed to the corn cracker by means of wheels.

37. Harvesting Machine; Henry Marcellus, Amsterdam, New York.

Claim—The corrugated finger bar cast with the cutting projections, in combination with the detachable fingers, constructed in the manner specified.

38. Rotary Engine; Charles Miller, Belleville, Illinois.

Claim—All the parts specified, in combination, being and constituting a rotary steam engine, as asked for in my petition.

39. Locomotive Machine for Propelling Ploughs, &c.; Wm. P. Miller, Marysville, California.

Claim—The combination of the endless chain or track with the leading and driving wheels and supporting trucks.

40. Mode of Attaching Harness Breeching to Wagon Thills; Aaron Parker, Coventry, New York.

Claim—The mode of attaching the hold-back straps to thills of vehicles, by having a metal ring to slide under a spring snap, in such manner that it will unfasten of itself when the traces are unhitched.

41. Vulcanizing Caoutchouc; D. D. Parmelee, City of New York.

Claim—1st, The method described of treating caoutchouc, gutta-percha, and their compounds, by employing agents in an æriform or gaseous state, combined with a solvent in a liquid state. 2d, In combination with a solution prepared in the manner specified, to operate on caoutchouc, gutta-percha, or their compounds, preparing the said caoutchouc, gutta-percha, or their compounds, by blending or incorporating therewith sulphur. 3d, Dissolving sulphur in the proportions set forth, or thereabouts, in the solution, prepared as specified, when the same is used in combination with rubber, gutta-percha, or their compounds, previously free from sulphur.

42. Cements; Nelson Parmeter, Gardner, Massachusetts.

Claim—An improved fire-proof cement, composed of said ingredients, in the proportions and in the manner set forth.

43. Wrench for Gas Fitters; G. P. Phillips, Albany, New York.

Claim—The jaw, arranged to slide, so as to wedge, gripe, or tighten and hold the article to be turned. Also, the nut, K, arranged to slide freely on the bar, and so that it may be locked to the bar, when desired, in combination with the bar. And in combination with the nut, the tightening nut, I, arranged as described.

44. Adjustable Pile-driver; Thomas Place, Alfred Centre, New York.

Claim—1st, Attaching the frame to the axles by means of the bolt, and rack plate, and guides, to admit the lateral adjustment of the monkey guides. 2d, Screwing the monkey guides in the frame, by means of the universal joint and the sliding joint, arranged with the lever and rack catch, or their equivalents, to admit of the lateral inclining of the guides, as well as the forward and backward movement of the same. 3d, The combination of the frame and guides, when constructed and arranged to operate conjointly, and to admit of the adjustment, as described. 4th, The arrangement of the button or stop, levers, and catch, automatically releasing the shaft from the windlass.

45. Latch Hinges; John Plant, Washington City, D. C.

Claim—The hinges, when provided with projections and latch, and when constructed as set forth.

46. Cotton Presses; H. W. Randle, Burnsville, Alabama.

Claim—The vertical screw shaft, as described, in combination with the levers, cords, and the follower.

47. Revolving Fire Arms; Joseph Rider, Newark, Ohio.

Claim—1st, The cocking-dog with its notches, applied in combination with the hammer and trigger, and with a stationary stop to effect the cocking of the hammer and firing. 2d, In combination with the above, providing the same cocking dog with a notch in its extremity to be operated upon by a tooth on the trigger, to operate the piece entirely by the trigger for rapidly repeated firing without cocking. 3d, Combining the locking lever with the cocking-dog, by means of a tooth upon the lever and a tooth upon the dog, the tooth being formed to operate as specified. 4th, The construction and application of the trigger guard, in combination with the locking levers, to serve three purposes, viz: as the guard, as the lever for operating the rammer, and as the spring for operating the locking lever, or its equivalent.

48. Cider Mills; Joseph Rosencrans, Avoca, New York.

Claim—The arrangement of the cutting cylinder and the tearing cylinder within the hopper, the one acting upon a plane and the other upon a curved surface, and the tearing cylinder so geared as to have rapid rotation as regards the rotation of the cutting cylinder. 2d, The arrangement of the grinding cylinders and pressing cylinders with the endless apron, chute, and hopper, when they are geared, as set forth.

49. Mail Bags; Washington Ruddach, Baltimore, Maryland.

Claim—The arrangement of the jointed plates, staples, jointed slide, with projection, when applied to bags with riveted and stitched seams.

50. Punching and Stamping Press; Stephen P. Ruggles, Boston, Massachusetts.

Claim—So combining in a press for punching, stamping, &c., a coarse and fine threaded screw, with the power that drives the press, as that the coarse screw may be in action when speed or motion is required, and the fine screw when power is required; the former ceasing its action and the latter coming into action according to the resistance against the punch or die.

51. Corn and Cob Cutter; Samuel B. Shinn, Philadelphia, Pennsylvania.

Claim—The peculiar construction of the cutter head, with or without the combination of the knives and crushers, arranged in the manner set forth.

52. Washing Machine; Olloff Shostrom, Altona, Illinois.

Claim—The combination and arrangement of slats, levers, serrated plates, with rods, false bottom, endless apron, lever, and pawl.

53. Coffee-roasters; Jonathan P. Simmons, Baldwinsville, New York.

Claim—The combination of the revolving ring with the spherical case, as specified.

54. Spinning Flyers; D. F. Smith, Manchester, New Hampshire.

Claim—The construction of the arm and stem of the compresser of one piece and the stop of a separated piece, so applied as to confine the stem in the ears on the flyer-tube.

55. Harvesting Machines; Joseph D. Smith, Lancaster, Ohio.

Claim—1st, The arrangement of the mechanism for adjusting the cutting apparatus, consisting of the rack bars, hinged to the cutting apparatus shaft provided with pinions, and ratchet wheel and pawl, when employed in combination with the adjustable wheel, in the manner specified. 2d, The employment of the ball journals of the reel shaft, in combination with the off-side horizontally turning timber of the reel frame. 3d, The combination of the secondary standard, arranged on the sickle bar with the hinged laterally adjustable brace, in the manner described. 4th, The combination with the upward curved edge of the sickle bar, of the overhanging upper lip and under back extension flanch of the sickle guard or tooth. 5th, The spring catch arranged on the sickle back, in combination with the stop-notch formed in the pitman, for the purpose of fastening the sickle or cutter-back to the pitman.

56. Rotary Planing Machines; Wm. H. Smith, Newport, Rhode Island.

Claim—The combination of the rotating cutter head with the central adjustable bearing plate, arranged as set forth.

57. Portable Horse Powers; George W. Swift, Oxford, Mississippi.

Claim—The arrangement of band wheel, shafts, idlers, roller, and cord or chain.

58. Machine for Cutting Wooden Curved Mouldings; Isaac P. Tice, Baltimore, Maryland.

Claim—The adjustable bed formed of the blocks in connexion with the flexible guide plate, rotary cutter head, and the feed or pressure rollers, or their equivalents.

59. Signals for Firemen; Hezekiah D. Treadwell, Elmira, New York.

Claim—The combination of the catch plates and conical stops, or their equivalents, on the cords, working through a series of holes in the catch plates.

60. Water Wheels; Wm. Walker, Pontiac, Michigan.

Claim—1st, The employment or use of the adjustable plates attached to the inner posts of the plates, e, of the buckets. 2d, Providing the buckets with adjustable plates to prevent injury to the buckets by the entrance into the scroll of hard foreign substances.

[This invention relates to an improvement in horizontal centre-discharge water wheels, and consists, first, in having the front or outer parts of the buckets made movable or adjustable in such a way that in case of stones, sticks, or foreign substances of any kind entering the scroll, the buckets will be allowed to yield or give, and be prevented from being broken. The invention consists, secondly, in the employment of a series of adjustable plates or stops, applied to the wheel in such a manner that the issues or discharge orifices between the buckets may be enlarged or contracted as circumstances may require.]

61. Lamp Shades; Charles and Anna C. Wilhelm, Philadelphia, Pennsylvania.

Claim—The combination of the metallic shade with the paper pictures between the sheets of mica.

62. Metallic Lathe; Wm. E. Worthen, City of New York.

Claim—A corrugated pierced sheet of metal, substantially such as specified, either with or without rods or tubes passed through the apertures.

63. Harvesting Machines; W. A. Wood, Hoosick Falls, New York.

Claim—Effecting an oblique delivery of the cut grain from the platform where it falls, by a series of carrying belts of different lengths.

64. Machine for Making Pearl Barley; August Wulze, St. Louis, Missouri.

Claim—The arrangement and combination of the frame or wheel, H, pinions, t and u, and wheel, L, with each other and with the pulleys, as set forth.

65. AIR ENGINE; Stephen Wilcox, Jr., Westerly, Rhode Island.

Claim—1st, The arrangement of the changing cylinder, B, and working cylinder, D, and the valve or valves by which piston, b, is made both to change the air from the cold to the hot end of the cylinder, and to receive a fresh volume of air from the next stroke, with the advantages set forth. 2d, Automatically regulating the temperature of the interior of the heating surfaces by the employment of the parts, H and L, arranged relatively to the heating surfaces of the cylinders, A and B, and to the damper, or its equivalent, in the flue. 3d, Giving the regenerator an increasing area from the cold to the hot side. 4th, Working the single valve, in combination with the two pistons, a and b, as described, so as to thereby accomplish the threefold purpose of induction, eduction, and equilibrium valve.

66. AMALGAMATOR: F. B. Cavanah, Assignor to self and R. H. Northrop, Pioneer Mills, North Carolina, and W. A. McCulloch and E. C. Aiken, Albany, New York.

Claim—The arrangement and combination of the elevated quicksilver channels near the rim of the oscillating amalgamating pan.

[This machine is more particularly intended for the washing and amalgamation of gold found in quartz rock, but also applicable to the extraction, by washing and amalgamation, of gold and other metals from various foreign substances with which they may be found incorporated in nature. It consists of a circular pan containing a peculiarly constructed series of concentric channels, arranged to oscillate about a vertical axis, and furnished with a central funnel and distributing cone to cause the pulverized metalliferous matter from which the gold or other metal is to be extracted, to be fed with a suitable amount of water all round the outermost channel, from whence it has to make its way from one to another of the several channels over and among quicksilver, which is contained in certain or all of the channels, to a discharging pipe or orifice at or near the centre of the vessel.]

67. CEMENTS FOR ROOFING; Nathan A. Dyar, Medford, Assignor to self and Rufus Kendrick, Cambridgeport, Massachusetts.

Claim—A central layer or web of cloth, or its equivalent, covered on both sides with adhering layers of water-proofing, the outward side of one of which is covered with a layer of paper fixed thereto by contact with the water-proofing while it is in a warm and plastic state, while upon, and embedded in, the outward side of the other layer of water-proofing, while in the state just described, is a layer of sand, or its equivalent, forming the uppermost or weather surface of the article.

68. MECHANISM FOR OPERATING STEAM OR AIR SIGNAL WHISTLES; Moses G. Farmer, Salem, Assignor to Wm. F. Channing, Boston, Massachusetts.

Claim—The combination of an electro-magnetic escapement with the mechanism described for operating a steam or air whistle.

69. REED ORGANS; Theophile Auguste Rousseau, Belleville (near Paris), Assignor to Edouard Alexandre, Paris, France; patented in France, January 23, 1857.

Claim—1st, The arrangement of the wind chambers and registers or stops, in combination with the reeds, whereby each key operates as many valves as there are stops in the instrument, but only those notes are caused to sound where the register is open, thus rendering the fingering easy whatever may be the number of stops. 2d, The arrangement of the valves and knee-pieces, in the manner specified. 3d, The manner specified of arranging the various plans or stories of the instrument, and hinging the same together for affording access to the different parts.

70. VALVES FOR STEAM ENGINES; Wm. Shepherd, Jr., Assignor to Thomas Holmes and Van Wyck Foster, Brooklyn, Eastern District, New York.

I do not claim the prevention of the slamming of the valve, without reference to the means by which such result is accomplished; neither do I claim, broadly, the interposition of a steam cushion to check the motion of the valve. But I

Claim—The combination of the steam ports with the cover operated by the action of the valve, substantially as described.

MAY 10.

71. CULTIVATORS; Milton Alden, Auburn, New York.

Claim—The described arrangement and combination of the adjustable shares, the frame, and the raised thills, which are made out of one piece with the handles.

72. MACHINE FOR SAWING SHINGLES; Wm. H. Auld, Brighton, Iowa.

Claim—The adjustable saws in connexion with the reciprocating bolt carriage. Also, the arrangement of the notched racks, gearing, weight, pins, levers, and bars, attached to the bolt carriage, in connexion with the stops for automatically feeding the bolt to the saws.

73. MACHINES FOR SEPARATING STONES, &c., FROM CLAY; Charles Bamberg and Roman Blaser, Chicago, Ill.

Claim—The conical rotating screen, in connexion with the separator placed within suitable boxes.

[A conical screen of knives is connected with a separator, and placed in a suitable box provided with discharge spouts, and this forms the invention, the object of which is to separate large gravel, stones, and all coarse foreign substances from clay preparatory to its manufacture into bricks, pottery, &c.]

74. SOLE-CUTTING MACHINES; Jacob Batchelder, Salem, Massachusetts.

Claim—1st, The particular and relative arrangement of the levers with the cranks for giving the required motions to the cutting knives. 2d, The use and arrangement of the adjustable and intermediate gauge board, whereby each alternate sole can be cut of equal or unequel width.

75. STRAW CUTTERS; John Bean and Benjamin Wright, Hudson, Michigan.

Claim—The arrangement and combination of the knife, lever, and rock shaft.

76. RAILROADS FOR STREETS; S. A. Beers, Brooklyn, New York.

Claim—The construction of upright self-sustaining rails of cast or other iron, with car and carriage track combined, to be laid in public streets and highways, and for no other purpose.

77. BRICK MACHINES; H. T. Beggs, Liberty, and James Allen, Lynchburg, Virginia.

Claim—The combination of the bevel wheel cast with the cells therein, for the reception of the moulds, the plungers, with the friction rollers and axles, circular inclined plane ring, guard, and top plate.

78. SKATE FASTENING; Edward Behr, City of New York.

Claim—Drawing or tightening the toe and heel straps of the skate around the foot of the wearer, by means of the screw rods and nuts fitted in the stock, one end of the straps being attached to the stock, and the opposite end to the nuts by means of the cords, or their equivalents.

79. SHIPS' STOP BLOCKS; A. J. Bentley and Wm. H. Allen, City of New York.

Claim—The arrangement of rollers and wedges.

[In this block the rope runs between wedges provided with rollers, and the moment the wedges are released, they are pressed together by two helical springs, and the more the rope is pulled, the faster it is held between the edges.]

80. CORN PLANTERS; L. F. Bingham and N. O. Pierce, Chicago, Illinois.

Claim—The arrangement of the rotating planter, square tube, beam, lever, "spat down" or leveler, and scraper.

81. CORN PLANTERS; A. W. Brinkerhoff, Upper Sandusky, Ohio.

Claim—The adjustable coverer and opener, in combination with lever, L, the weighted lever, A, operating the rollers and rod.

82. MANUFACTURE OF PAPER AND PAPER PULP; James Brown, London, England; patented in England, June 10, 1857.

Claim—The treatment of paper and paper material with glycerine, to be employed for printing or other purposes.

83. PLOUGHS; C. M. Bryan, Wright City, Missouri.

Claim—Attaching the mould-board by means of the bolts passing through cleets at the inner side of the mould-board, and into the landside and handle, the bolts and the brace bar.

84. MACHINES FOR LOADING HAY; S. V. Essick, Moultrie, Ohio.

Claim—The adjustable frame, the rake, the rakers, and the conveyors.

85. MACHINES FOR SEWING FERTILIZERS; T. J. Burrall, Geneva, New York.

Claim—The arrangement of the revolving cylinder, divisions, and adjustable perforated slides.

86. MACHINES FOR SPLITTING LEATHER; D. H. Chamberlain, West Roxbury, Massachusetts.

Claim—Inclosing the cutting blade within an external casing throughout its entire length.

87. CONVERTIBLE CARRIAGE SHAFTS; R. J. Colvin, Lancaster, Pennsylvania.

Claim—1st, The attachment of removable shafts by means of adjustable braces and the hinged caps of the pole crab. 2d, The curved or segment bars forming a transverse horizontal slot in which the shafts are supported at their rear end, both when separated in the ordinary way, and when united together as a pole. 3d, The hinged and pivoted thill attachment for accommodating the width of the same to the different positions of the clips upon the axle.

88. BUTTERFLY VALVES; Nathan Cope and Wm. Hodgson, Cincinnati, Ohio.

Claim—The arrangement and combination of the curved slotted plate, valve-box, stops, and slotted valve lever.

89. GRAIN SEPARATORS; J. B. Crist, Evansville, Indiana.

Claim—The arrangement of the blast passage, fan, screen, and riddle, with chute attached, placed within the case or box, and in relation with the spouts or discharge passages.

90. PLOUGHS; E. Davidson, Batesville, Arkansas.

Claim—The combination of the bar, stirrup, rod, with the adjustable supplemental landside, F, share, G, and the stationary share, E, and landside, C.

91. FENCE POST; H. T. Dewey, Sandusky, Ohio.

Claim—The combination of the ribbed post and horizontal flanch plate, when jointed to each other.

92. CULTIVATORS; Wm. C. Doss, Lavacca, Texas.

Claim—The arrangement of the triangular frame of shares, with mould-boards that may be taken off at pleasure, scraper, and cultivators.

93. FURNACES FOR HEATING BUILDINGS; B. W. Dunklee, Boston, Massachusetts.

Claim—Combining with the fire-pot and its dome one or more gas-circulating pipes arranged with respect to the same, and in the hot air chamber of the case. Also, the arrangement of the hot air discharge pipes, and the wings of the arch of the fire dome. Also, in connexion with air register to the front of the ash-pit, an air pipe, carried through the air chamber and into the rear part of the ash-pit. Also, the combination and arrangement of the hoc valve and the plate or door with the flue, the pipe, and the opening.

94. METHOD OF COMPENSATING FOR EXPANSION AND CONTRACTION OF METALLIC FENCES; Lewis Eikenberry, Easton, Pennsylvania.

Claim—The method of making provision for expansion and contraction in an iron lattice or other open work fence.

95. STRAW CUTTERS; Stephen Elliott, Richmond, Indiana.

Claim—The arrangement of boards, E, cross-piece, rods, J and G, and lever, H, with boards, B and D, canvas, C, rods, R and S, and lever, Q.

96. SMOOTHING IRON; Andrew Ellison, Boston, Massachusetts.

Claim—Attaching the handle plate to the separate heater or block, by means of the guide and slot, the angular recess and lips, and the latching devices.

97. METHOD OF STRAPPING WOOD IN BENDING; John L. Field, Syracuse, New York.

Claim—The method for connecting metallic straps for bending timber, when the parts are so arranged as to operate in connexion with the forming frames.

98. SEED PLANTERS; D. S. Fisher, Mauckport, Indiana.

Claim—The combination and arrangement of the spring hoe, adjustable spring roller, with the seeding and regulating apparatus.

99. HARROWS; J. H. French, Syracuse, New York.

Claim—1st, The combination and arrangement of three triangular harrows, in such manner as to form

one triple triangular harrow, by connecting the angles with flexible joints or couplings, which admit of the free vibration of the parts, and their ready adaptation to the inequalities of the ground. 2d, Constructing triangular harrows of metallic bars or flat strips of metal, by folding over the same at the angles, in such a manner that the draft strain of the teeth upon one side, shall counteract that upon the other, and forming the couplings at the same operation, by folding in links or hooks at the angles, no bolts being required to secure them in consequence of the self-bracing of the parts.

100. Corn Planters; R. B. Gilbert, Sutherland Springs, Texas.

Claim—The arrangement of the share, coverers, conductor, cylinder, and hopper, wheel, and scraper, for joint operation.

101. Mail Bags; Richard Gornall, Baltimore, Maryland.

Claim—The employment with a mail bag, constructed with a socket and furnished with a lock or other safe fastening of the plates, which terminate in nearly complete tubes, and with the jointed rod or bolt, provided with a hasp or other similar attachment.

102. Rat Traps; Henry Gortner, Irville, Ohio.

Claim—The rotating discs connected by the plates, b b, in connexion with the treadle platform, plates, c c, and bar, d, and the supplemental platform, the whole being fitted to the box.

103. Mechanism by which Employees Register their Time; Benjamin T. Harris, Brooklyn, New York.

Claim—1st, The manner of mounting the cylinder on the spring barrel, and with the connecting coupling. 2d, The binding plate, fitted and acting to retain the ends of the paper to the cylinder. 3d, The arrangement and manner of constructing the slides and impression point. 4th, The rollers and their pawls, in connexion with the slides and openings in the front plate.

104. Corn Planters; Samuel E. Hartwell, City of New York.

Claim—The arrangement of the slide, shoe, and hoe, connecting and acting in the manner as specified.

105. Seeding Machines; Samuel Henry, Chenoa, Illinois.

Claim—The slide bar or seed-distributor, with slide fitted therein and placed relatively with the seed-box.

106. Harvesting Machine; Moses G. Hubbard, Penn Yan, New York.

Claim—The conformation of the intermediate fingers of a reaping and mowing machine, having a conical form with a straight outline from point to heel, so as to present a straight gradual taper on the underside as well as above. Also, the safety flanch for securing the pitman connexion.

107. Machines for Breaking Coal; Charles W. Kennedy and Richard T. Brown, Williamsburg, New York.

Claim—The arrangement and combination of the polygonal spiked drum, spiked crushing plate, and spiked clearing plate.

108. Railroad Car Brakes; Lewis Kirk, Reading, Pennsylvania.

Claim—1st, The arrangement of the hand-wheel and the rod, in combination with the pump, so that by depressing the rod the pump is placed in working order, and that the same can be operated by means of the hand wheel. 2d, The arrangement of the spring catch which is attached to the piston rod of one of the pump cylinders, in combination with the bell crank, or its equivalent, which is operated by means of an eccentric. 3d, Arranging the coupling on a rod in such relation to the spring catch and the cock, that by exercising a pressure on the coupling, the rod is turned sufficiently to open the cock, and to depress the spring catch.

109. Mail Bags; Thomas J. Lamdin, Baltimore, Maryland.

Claim—The placing of the staples or buckles on the flap of the bag or pouch, so that when the flap is turned down, said staples or buckets will pass through the grummets. Also, the manner of forming the seams of the bag or pouch, so that they cannot be cut open and re-sewn from the outside of the back without instant detection on looking at the seam, as its whole character must be changed in any such attempt or effort.

110. Apparatus for Conducting Water to Cisterns; Jabez Lewis, New Orleans, Louisiana.

Claim—Making the change in openings from the box, or its equivalent, by the employment of a weight containing water supplied from a roof, when the weight can lose the water it contained, and thus reduce its force of gravity to allow another change to be made, by which the water is conducted in separate directions from and to the cistern.

111. Jib-boom for Vessels; Charles L. Linnell, Truro, Massachusetts.

Claim—The application of the after jib-boom to the bowsprit by means, not only of the slide rod applied to the bow-sprit, but the slider connected with the boom.

112. Spoke-shave; Benjamin Tolman, Assignor to self and A. T. Ramsdell, Pembroke, Massachusetts.

Claim—A spoke-shave, constructed with an adjustable knife and adjustable throat gauge, arranged and applied to the stock so as to move with respect to one another.

113. Bench Plane; Wm. S. Loughborough, Rochester, New York.

Claim—1st, The combination of the screw, 2 (which takes effect in the projection. R), spring or yielding cap, bit, and screw, 1, for the purpose of varying the cut of the bit, and at the same time, and proportionally, the space of the throat, the base of the bit being the fulcrum upon which it swings when said changes are made, the said combination being applicable for the adjustment of the bit in all kinds of planes. 2d, The adjustable parallel fence, constructed with diagonal slots for the set-screws, said fence being applicable to match planes, and also the stop with the slot running up diagonally from the face, the set-screw, and the guide pin keeping it in position, said stop being applicable to panel ploughs and dadoes.

114. Improved Rotary Engine; Samuel D. Lount, Summerville, Michigan.

Claim—The arrangement and combination of the rotating head, provided with sliding pistons, and placed eccentrically within the case, the saddles applied to the pistons and the valves.

115. Apparatus for Laying Metal Leaf on Mouldings, &c.; Robert Marcher, City of New York.

Claim—The method of laying leaf metal on mouldings, and other surfaces, by means of a roller. Also, operating the roller in laying leaf metal on surfaces by the force of capillary attraction. Also, the combination of the rails, the table for holding the book of leaf metal, and the means for holding the article to be gilded or silvered, or the equivalents of the said elements, in combination with the roller. Finally, the combination of the roller and rails, or equivalent guide ways, with the rebate, or equivalent gauge.

116. Railroad Switch; T. Mayhew, Poughkeepsie, New York.

Claim—The employment or use of the adjustable platform, in connexion with the switch bar and gearing, springs and stops.

117. PUMP BOXES; John Munson, San Jose, California.

Claim—Constructing the pump boxes of the rings and bands, provided with the uprights and the traverse plates, when the boxes thus constructed are provided with the valves fitted thereon. Further, securing the lower box in the bottom of the cylinder, by means of the traverse plate on said box, and flanch, secured to the inner side of the cylinder.

118. PLANT PROTECTORS; Eli Mosher, Flushing, Michigan.

Claim—The arrangement and combination of the folding sides, cover, and fastening cord.

[These protectors are simply rectangular wooden boxes covered at the top with gauze or some other material which will admit the sun's rays, air, and moisture, and at the same time exclude the insects; the boxes being set over the plants they are to protect.]

119. WIND-MILLS; Wm. McAllister, South Reading, Massachusetts.

Claim—The series of narrow sails attached to vertically sliding rods, and united by means of the cords, and operating in combination with the adjusting ropes.

120. PLOUGHS; James C. Molthrup, Bucyrus, Ohio.

Claim—Giving the beam longitudinal and vertical motion by means of the bearing plates, slots, short rear bolt, b, and long vibrating front bolt.

121. MANUFACTURE OF FELT HATS; James Monach, Rahway, New Jersey.

Claim—The corrugation of the brims of felt or soft hats by the employment of dies on both sides of the brim, whereby the corrugation is attained without stretching the brim, both the surfaces being finished at one operation.

122. ROASTERS; James Mulligan, City of New York.

Claim—The detachable journal bearings, constructed so as to be clamped on to the edges of the openings in the stove or range, and receive the spit.

123. PLOUGHS; Williamson Nichols, Floyd Co., Georgia.

Claim—The arrangement of the forked beam, segmental head, holes, bolts, clevis, stock, handle, rivet and holes.

124. BRIDLES; R. B. Norvell, Huntsville, Alabama.

Claim—The cord, attached to a bridle or halter by passing the same through the bit rings or halter rings, and over the pulleys, or their equivalents, and under the throat of a horse, or other animal.

125. IRON TIES FOR COTTON BALES; James Nuttall, New Orleans, Louisiana.

Claim—The combination of the plate and movable clasp, when made use of in confining the hooks as a fastening for iron ties for cotton bales.

126. CLOTHES FRAME; Henry A. Nutting, South Amherst, Massachusetts.

Claim—A clothes frame, composed substantially of the rod or stem, the two hubs, and the two sets of arms.

127. CULTIVATORS; Isaac B. Palamountain, Tarboro', North Carolina.

Claim—The arrangement of the beam, stock, centre bar, standard, wings, share, and seat.

128. HORSE HAY-RAKES; George S. Reynolds, East Bethel, Vermont.

Claim—The arrangement of the boxes, arch arms, elastic spring, shoe, strap, t, frame, and strap, l.

129. TOOLS FOR MANUFACTURE OF FIRE ARMS; Augustus Rebetey, Norwich, Connecticut.

Claim—The use of a crank shaft to carry a cutter, such crank shaft suspended at the centres of an engine lathe, or any similar machine, and receiving its motion from the counter-shaft of such lathe, or similar machine, for the purpose of cutting an eccentric shaped slot in the barrel of a pistol, or anything else.

130. WATER WHEELS; Sylvanus Richardson, Jericho, Vermont.

Claim—The construction and arrangement of the shutes formed by irons, and the arrangement of openings in plate f, in fig. 3, and corresponding openings in plate f, in fig. 5, and the arrangement of plate, c c, and wheel, and case, and draft tube, and the combination of the same.

131. HEMP BRAKES; John W. Rinehart, Lexington, Missouri.

Claim—The particular manner of operating the beater frame, by means of the lever, j, links, lever, l, shaft, arm, connecting rod, and crank.

132. HERNIAL TRUSSES; S. S. Ritter, Philadelphia, Pennsylvania.

Claim—1st, The construction of a surgical truss having a short spring with one or more plates of metal, extending in front about half round the body, and held by a strap or straps, forming the other half of the girdle, when the said spring is curved, as shown, for the purpose of making a more agreeable pressure on the hernia, and for fitting the ends of the spring better to the hips, thus rendering the truss more comfortable to the patient. 2d, The described pad, having a central prominence surrounded by a groove and ridge, when the face of said pad is made in one piece.

133. APPARATUS FOR VULCANIZING RUBBER; Edward A. L. Roberts and Wm. J. Demorest, City of New York.

Claim—The general arrangement of the stove, boiler, and vulcanizing chamber.

134. GRAIN SHOVELS; David B. Rogers, Pittsburgh, Pennsylvania.

Claim—The so bending a plate of iron into the shape of a shovel as to form a socket for the handle out of the same piece of iron.

135. CLOCK DIAL; S. E. Root, Bristol, Connecticut.

Claim—The combination of a clock dial, metallic back, and frame, specifically as described.

136. PRINTING PRESSES; Stephen P. Ruggles, Boston, Massachusetts.

Claim—1st, The combination of two screws having different sized threads, and operating together to give a greater motion to a platen, or its equivalent, at one time, and more power at another time, as may be desired. 2d, Connecting two such screws together, and to the lever or bar that actuates them, by a strong helical spring, that, by being wound up, becomes a clamp, so as to put the two screws in action one after the other. 3d, Running out the bed of the press on inclined ways for the purpose of increasing the distance between the bed and platen, which makes a better entrance for the frisket, blanket, sheet, form, &c., by affording more space when they are being run under the platen.

137. Automatic Primer for Fire Arms; Jacob Rupertus, Philadelphia, Pennsylvania.

Claim—1st, The feeding slide lever, applied in combination with the hammer to constitute a portion of the thumb-piece thereof, and with an interposed spring. 2d, Constructing and applying the feeding piston to roll within the magazine, as set forth. 3d, Attaching the feeding piston which drives the priming forward in the magazine to a spring or flexible driver, which winds on and off a spring barrel.

138. Pumps; John Selser, Williamsport, Pennsylvania.

Claim—1st, Draining the standing pipe and relieving the air chamber from pressure by allowing the water to escape upward through the cylinder, whenever the plunger rod is sufficiently depressed, thereby draining the pipe without draining the pump itself. 2d, The splash plate with its aperture, when used in connexion with the vertical termination of the discharge pipe.

139. Shafting for Endless Chain Horse Powers; Theodore Sharp, Bloomington, Illinois.

Claim—The sliding shaft, reels with slotted or mortised hubs, constructed and operating as described.

140. Seed Planters; David M. Smith, Springfield, Vermont.

Claim—The combination of the following devices for operating the dropping slide, viz: the spring, the rack, the pinion, the rack lifter, the groove of the rack, and the latch. Also, the application of the rack lifter to the rack so as to be adjustable thereon, in the manner set forth. Also, combining with the rack and apparatus carried by it, the latch elevator for moving the rack out of gear with the pinion, and holding the rack from slipping or being thrown backward, the object being not only to prepare the rack for causing the machine to plant the first dropping of seed in the right place, but to hold the rack out of gear with the pinion while the machine is being moved over the ground, where it may not be desirable to have it plant seed.

141. Rotary Steam Engines; Mathew Smith, Pittsburgh, Pennsylvania.

Claim—The combination and arrangement of a revolving cylinder, steam chest, cam yoke, supply and exhaust passages, with a stationary cam, supply and exhaust chambers, when combined and operated as described.

142. Lathes for Turning Irregular Forms; Charles and Andrew Spring, Boston, Massachusetts.

Claim—The combination of a griping chuck by which an article can be so held by one end as to present the other free to be operated upon, with a rest preceding the cutting tool, when it is combined with a guide cam, or its equivalent, which modifies the movement of the cutting tool.

143. Apparatus for Superheating Steam; George A. Stone, Roxbury, Massachusetts.

Claim—A steam jet, or the equivalent thereof, located substantially in the position and serving the purposes specified, in combination with a superheating apparatus, which is heated by a portion of the gaseous products of combustion.

144. Raking Attachment for Harvesting Machines; George Tatlock, Salem, Indiana.

Claim—Operating the rake-head which is pivoted to the sliding bar through the medium of the rotating shaft, connecting rod, rock shaft, connected respectively with the rod and sliding bar by the arms, in connexion with the arm attached to the rake-head, the loop or guide attached to the arm, and the bars or arms attached to the platform.

145. Bureau Bedstead; H. L. Thistle, City of New York.

Claim—Combining the bedstead frame with the wardrobe, or other case, by means of the hinged links and movable slides, whereby the bed can be let down to a lower level than by any other construction before known, while at the same time it can be let down by a single movement, and within a space no longer than the bedstead, and without the necessity of first drawing out part of the structure from the wall, or making joints in the side rails or pieces, the hinged links and slides giving to the structure all the foregoing advantages. Also, in combination with the bedstead frame connected with the case by the hinged links and slides, the weighing of the head end of the frame to balance the weight of the foot end when lifting it up, and thereby facilitate the manipulation. Also, forming the support for the foot end of the bedstead frame by a hinged panel, so that the said support, when the bed is thrown up, shall form part of the front of the wardrobe, or other piece of furniture.

146. Harvesting Machines; Samuel Thomas, Burnett, Wisconsin.

Claim—The false pole with its attached sliding gauge, which may be adjusted at pleasure, so as to prevent side draft and pressure upon the near horse.

147. Rotary Harrows; George W. Toleman, Augusta, Kentucky.

Claim—The arrangement of the frame, shaft, iron circle, roller, rods, and rod or hook, operating conjointly, as set forth.

148. Stoves; John Van and Henry V. Barringer, Cincinnati, Ohio.

Claim—The swinging grated door or hearth, and sliding swinging register, in combination with the supporting legs and stove, arranged as set forth.

149. Hillside Ploughs; Edward Van Camp, Beadington, New Jersey.

Claim—Making the share, the landside, and the landside brace of hillside ploughs, each in one piece, and uniting them together to the mould-board and beam, in the manner set forth.

150. Grain Separators; James Vaughn, Magnolia, Illinois.

Claim—The arrangement and combination of the semi-cylindrical hopper having a depression in its centre, with the screen, buckets, spout, D, fan, and spout, I, as described.

151. Meat Slicer; Wm. Vine, Hartford, Connecticut.

Claim—The beveled lip and the pendant, for the purpose described, in combination with the other parts of the dried meat slicer.

152. Lock; Thomas K. Webster, Lawrence, Massachusetts.

Claim—The guard or fender, as described.

153. Churn; Leonardo Westbrook, City of New York.

Claim—The use of the projecting rim and the revolving disc working over the same, in combination with the fixed and revolving radial dashers, and with or without the regulating thumb-screw.

154. Ice-pick; Milton, Howard, Henry T., and Joseph White, Philadelphia, Pennsylvania.

Claim—The combination of the ball and tube sliding upon the stem, in such a manner that the blow may be struck upon the head of the stem.

155. Stoves; John George Widmann, City of New York.

Claim—The arrangement and combination of the gas tubes with the cylinder and fire openings, so that the gases which arise from the heating of the coal will be compelled to pass down into the fire.

156. Harvesting Machines; Hosea Willard and Robert Ross, Vergennes, Vermont.

Claim—1st, The arrangement and combination of the hinged bar with the lever, as described. 2d, The arrangement and combination of the adjustable spring, bar, adjustable rod, spring, and finger bar, as described.

157. Harvesting Machines; Wm. H. Wilson, Denton, Maryland.

Claim—1st, The combination of the vibrating sector, rack, lattice frame, and carriage, with the beam, or its equivalent, and the rake. 2d, In combination with the rake having its centre driven backward and forward over the platform, the swiveling plate, ratchet, and pawl, and adjustable shifting stop, or its equivalent, whereby the rake is turned upon its centre and caused to sweep the grain off. 3d, In combination with the rake having its centre driven back and forth over the platform, as specified, the guiding plate and rolls, or their equivalents, whereby the rake is thrown back into the proper position to sweep across the platform after having discharged a sheaf. 4th, The combination of the rod, M, with the rod, S, arm, cam, and spring. 5th, The stop, arranged as described.

158. Combined Metallic Street Curb and Gutter; Wm. E. Worthen, City of New York.

Claim—The compound metallic curb and gutter, constructed in the manner specified.

159. Ploughs; T. J. de Yampert, Shohola, Pennsylvania.

Claim—A revolving cone having under-cut or overhanging curved flanches or wings that extend entirely from the base to the point of the cone, so that it will revolve upon its shaft or journal by the resistance of the earth alone against it, and without being driven by other forces. Also, in combination with a cone furnished with spiral under-cut flanches, and revolving by the resistance of the earth against it, the mould-board and landside for turning over the loosened earth, and directing the plough in its path, as described.

160. Pruning Knife; G. G. Belcher, Assignor to self and Joseph S. Hill, Worcester, Massachusetts.

Claim—1st, Arranging the blade of a knife in such a manner that it opens and closes by turning one or both parts of the handle. 2d, The pins on the blade, arranged in combination with the slots in the plates of the handle, for the purposes of operating the blade and keeping the same rigid when it is opened as well as when it is closed. 3d, The slide, or its equivalent, arranged in combination with the eye, for the purpose of securing the two parts of the handle together.

161. Boot-crimping Machines; James D. Black, Assignor to self and Ezekiel Hallet, Jr., Boston, Mass.

Claim—Machines for crimping boot-legs, in which the "hitch-on" is raised by the hand of the operator, pivoting the device by which the "hitch-on" is raised to a spring clock, or its equivalent. Also, the peculiar construction of "hitch-on" described, the movable jaws being temporarily closed upon both sides by a spring, so that they may be separately opened for the insertion of the leather, and may be permanently closed by a single screw.

162. Hand-plane; Simeon S. Dodge, Sunapee, Assignor to self and Edmund Burke, Newport, N. H.

Claim—1st, The curved adjustable cap iron, constructed as described. 2d, The combination of the adjustable cap iron with the bolt, the set-screws, the thumb-screw, and the break iron, as described.

163. Knapsacks; Wm. Griffiths, Assignor to self and Joseph H. Lambert, Philadelphia, Pennsylvania.

Claim—A military knapsack having the usual frame or case, made and adapted thereto, so as to be convertible.

164. Corn Planters; Wm. H. King, Assignor to self and Nelson Colson, Charleston, Illinois.

Claim—1st, In combination with the cams and the arm, the arrangement of the rods in such relation to the seed cells that they push out the corn contained in the same. 2d, The arrangement of the marker, in combination with scraper, so that the same never fails to make a clear mark in the track of the driving wheel.

165. Seed Drills; Charles Learned, Assignor to self and George P. Stevens, Indianapolis, Indiana.

Claim—The guard or series of straps, in combination with the toothed roller and elastic guard, when operated in connexion with the roller and agitator.

166. Making Steels for Sharpening Knives; Samuel Lee, Assignor to Charles S. Pomeroy, Taunton, Mass.

Claim—The combination of these devices, so that by their continued action they shall produce a steel with sharp ribs or edges in the direction of its length.

167. Cooking Stoves; Henry G. Leonard, Assignor to Lemuel M. Leonard, Taunton, Massachusetts.

Claim—So constructing and arranging one or more of the oven plates of the stove, that it or they can be removed, and the flue or flues cleaned, and the plates replaced, without loosening or separating the plates which form the outside of the stove. Also, making one or more of the interior flue plates, so that it can be removed and the flue cleaned, and the plate replaced, without loosening or separating the plates which form the outside of the stove.

168. Single Thread Stitches; James S. McCurdy, Assignor to Elias Howe, Jr., Brooklyn, New York.

Claim—A single thread interlooped stitch, in which each successive loop is encircled by a tight coil of the thread of the preceding loop.

169. Device for Suspending and Liberating Ships' Boats; Daniel P. Mealey, Assignor to self and A. E. H. Johnson, Washington City, D. C.

Claim—The hanger, constructed with a seat or seats for the ring of the boat to rest upon, in combination with the seat formed in the tumbler, in such manner that the seat or seats of the hanger shall coincide with the seat in the tumbler, that a large proportion of the weight and strain may be supported by the hanger, which increases the power of the device to resist strains, and facilitates the unlatching of the tumbler. Also, in combination with the arrangement of the opening in the tumbler, in combination with the seats and that portion of the hanger which rises above and overhangs them, in such manner that when the seats of the hanger and tumbler coincide, the mouth of said opening will pass and be inclosed by the

hanger. Also, in combination with the tumbler and hanger, extending the legs of the hanger below the range of motion of the opening in the tumbler, so as to form a cut-off to the passage of the ring, and thus prevent it from being carried round with the motion of the tumbler. Also, in combination with a boat detacher making a recess or shoulder in the tumbler, in combination with a snug or projection on the dead eye, whereby the connexion of the ring of the boat with the tumbler may be made with one hand, when necessary.

170. CHURN; James O. Merrill, Assignor to Wm. A. Swain, Chichester, New Hampshire.

Claim—The arrangement of the oscillating lever and its weight with the vibrating shaft, the vibrating lever, the auxiliary levers, and the alternate reciprocating dasher arms, with their dasher, by which the oscillating power of the pendulum is applied to the process of churning butter.

171. FACTITIOUS ENAMELED LEATHER; James W. Munroe, Assignor to John Southworth and Wm. R. McKenzie, Fall River, Massachusetts.

Claim—The artificial leather, composed of two or more thicknesses of cloth united by cement and varnish, as set forth.

172. MACHINES FOR DIGGING AND GATHERING POTATOES; Jonathan B. Parvin, Assignor to self and Elias Stratton, Heightstown, New Jersey.

Claim—The combination of the weed cutter and roller, when mounted on a swivel and applied to a potato digger. Also, hinging the frame that carries the plough and the endless apron on the shaft, when used in combination with the lever, links, and rods, by which the operator from his seat can raise up, lower, or hold up the plough and apron. Also, the combination of the adjustable endless apron, horizontal and vertically vibrating grate, and the elevating apparatus.

173. BASIN COCK; G. W Randall, Assignor to Reuben J. Todd, Boston, Massachusetts.

Claim—The wash basin cock or faucet, as made with cold and hot water inlet passages, and the column passages, arranged in the socket and column, and with respect to the discharging spout, in order to enable a person, by turning the movable part or parts, to discharge either cold or hot water, or a mixture of the same from the faucet, or to close off both hot and cold water induction passages, as circumstances may require.

174. TOOLS FOR MANUFACTURING PISTOLS; Augustus Rebetey, Norwich, Connecticut, Assignor to the Manhattan Fire Arms Manufacturiug Co., City of New York.

Claim—The use of a frame having a profile in one plate of it, to shape and finish a corresponding recess in the side plate of a pistol, by means of a revolving cutter governed by the outlines of said profile.

175. ROTARY CUTTERS AND MODE OF OPERATING THEM FOR MOULDINGS; Frederick Schute, Assignor to self and Philip P. Weis, Philadelphia, Pennsylvania.

Claim—A revolving cutter, with any convenient number of double cutting edges of the form of the tongue, groove, bead, or hollow to be cut—one cutting edge being the reverse of the other in each pair, so that one cutting edge only of each pair shall have a cutting effect, when the cutter revolves in one direction—the other edge to cut when the cutter revolves in a contrary direction, and so that one cutting edge of each pair shall act as a guard, to prevent the adjacent edge from penetrating too deep into the wood, when the said cutter with double-cutting edges, thus constructed, is secured to a spindle capable of having the direction of its rotation readily reversed.

176. STEAM ENGINES; G. F. Lombard, New Orleans, Louisiana; patented in England, October 10, 1857.

Claim—1st, The relative arrangement of two cylinders, four pistons, two rocking beams, two steam chests with valves, and the specified connexions which combine and operate the same, in the manner set forth. 2d, The application of the exhaust steam of the engine to the crank or eccentric shaft, through a fly-wheel, constructed and combined with the engine and crank shaft.

177. STEAM ENGINE; J. A. Whipple, Assignor to James Whipple and B. F. Cooke, Boston, Massachusetts.

Claim—The described intermittent rotary engine, consisting of the cylinder, the heads, and pistons.

178. STEAM AND WATER GAUGE; Cornelia H. Williams, Williamsburg, New York, (Administratrix of the estate of Augustus Williams, deceased,) Assignor to Anthony Pollak, Washington City, D. C., Assignor to A. N. Clark, Beverly, Massachusetts.

Claim—1st, Combining the vessel separate and distinct from, but connected to, the boiler by means of two pipes containing a float having an indicator or pointer attached thereto, with the transparent tube or steam chamber. 2d, The general arrangement of the instrument for forming an alarm water gauge, by combining with the water gauge a whistle, attached to a separate chamber containing a valve arranged to be operated by the float, so as to admit steam to said whistle, to give alarm when required.

179. HORSE-SHOE MACHINE; J. B. Collen, Assignor to self and Pascal Yearsley, Philadelphia, Pennsylvania.

Claim—1st, Bending the heated bar of iron to the requisite form, by applying it to a revolving former of the shape of the inside of the shoe, when the said former is arranged to hold the bent iron, while it is acted upon by the dies. 2d, The combination of the revolving former with the cutter, when the latter is so arranged in respect to the former, that the edge of the cutter shall coincide, or nearly coincide, with the circular path traversed by the outer edge of the former, and when the cutter is hung to the movable bar, or its equivalent. 3d, The die, the spindle, its former, and the sleeve, in combination with the counter-die on the spindle.

180. CORK MACHINE; Albert Albertson, Assignor to C. C. Bean, City of New York.

Claim—1st, The stationary cylinder, or any substantially equivalent device, when employed to gripe a cork by its periphery, so as to effectually prevent its rotation while being cut by a rotary cylindrical cutter. 2d, The feed rollers (with or without the band), arranged and adapted to rotate a cork by friction upon its periphery, while under the action of a longitudinal cutter.

MECHANICS, PHYSICS, AND CHEMISTRY.

*On the Connexion between the Structure and the Physical Properties of Wood.** By Prof. Knoblauch.

From the "Sitzungsberichte der Naturforschenden Gesellschaft." Halle, 1858, vol. v.

The author seeks to ascertain *whether any connexion is ascertainable between the structural relations of various kinds of wood and their observed physical properties, such as their powers of resonance and conduction of heat, &c.*, in the same way as was done for one and the same wood by Savart in respect to resonance, and more especially by Tyndall in respect to the conduction of heat.

The primary object was to trace the difference in the conduction of heat shown by different woods, according as the heat has to traverse the wood in a direction parallel with, or at right angles to, the direction of the grain. For this purpose, slabs of the woods to be examined were bored through perpendicular to their planes, and then covered as uniformly as possible with a coating of stearine. A hot wire, exactly fitting the bore, was introduced into the latter and continually turned round during the experiment. By this means the coating of stearine around the orifice was melted; but, as we should expect, not in concentric circles, but in elliptic zones, whose major axes invariably coincided with the direction of the grain. The great difference in the behavior of different kinds of wood (about eighty sorts were examined,) under these circumstances is at once apparent. With some the ellipses are tolerably circular, by others more elongated, while by others, again, the major axes are so extended as to be nearly twice the length of the minor ones. The eccentricity of these ellipses, which furnished a graphical expression for the conductive power of the wood in the directions between which the structural difference was greatest, made it possible to divide the different kinds of wood into four distinct groups. In the first, the ratio of the minor to the major axis of the ellipse is on the average as 1 to 1·25. To this group, Acacia, Box, Cypress, King-wood, &c., belong. In the second, and by far the most numerous group, containing Elder, Nut, Ebony, Apple, several dye-woods, &c., the mean value of this ratio is 1 to 1·45. In the third group, to which Apricot, Siberian, Acacia, Brazil wood, Yellow wood from Puerto Cabello, &c., belong, the ratio is as 1 to 1·60. In the fourth group it is as 1 to 1·80, and to this division belong Lime, Tamarind, Iron wood, Poplar, Savanilla (yellow), &c. Hence, *the conducting power of all woods in the direction of the fibre exceeds that in the perpendicular direction by no means in a constant manner, but in one which depends upon the nature of the wood.* This superiority is in the first group so small, that the warmth in the direction of the fibre traverses a path only a quarter more in length than that traversed in the same time in a perpendicular direction. In the last group, on the other hand, the length of the path in the first direction is about twice that in the perpendicular one.

* From the Lond., Edin., and Dub. Mag., May, 1859.

In order to investigate the relations of resonance, two rods were cut from each kind of wood,—the one being taken in the direction of the grain (Langholz), the second perpendicularly across it (Hirnholz). On suspending these rods freely (their length was 470 millims., breadth 20 millims., and thickness 8 millims.) and striking them with a stick, the piece cut with the grain always gives a more sonorous tone than the corresponding cross-grain piece. Nevertheless, the difference of resonance in the tones of the width and cross-grain pieces of one and the same wood, of the first of the groups described (say beech), is unmistakably less than the difference between the tones of the with and cross-grain pieces of any member of the second group. In the second group this difference is less than in the third; and in the third, again, less than in the fourth (as with with- and cross-grain pieces of poplar). *When, therefore, the fibres of all kinds of wood are set in vibration, the purity of resonance is greater when such vibrations are transverse than when they occur in other directions (as when the rods are cut across the grain). But this superiority of resonance is not constant; it depends upon the nature of the wood.* The difference in this respect in the first group of woods is so small, that the resonance of two with- and cross-grain pieces resembles that of two not very dissimilar masses of stone when struck. In the last group the difference is so great, that the tone of the with-grain piece when struck has a metallic ring, while the dull sound of the cross-grain piece reminds one of a piece of pasteboard when struck. *The division of the woods examined, derived from their thermo-conductive power, is accordingly supported by their acoustic relations.*

By supporting the two ends of the rods employed in the above experiments and loading them equally in the middle, the degrees of deflexion which they undergo will give us an insight into their structural relations; for the greater their compactness, the greater the resistance they will offer to bending; and the less compact they are, the more easily will they yield. The difference in vertical height of the middle points of the bent and straight rods was taken as measure of deflexion. A lever was employed to determine this measure, the end of which passed over an enlarged scale in order that the readings off might be the more exact. The unit of this measure was a matter of indifference, inasmuch as in the comparison to be instituted, relations only had to be determined. Although, as was to be expected, in all cases the with-grain piece was much less flexible than the corresponding cross-grain piece, yet an important difference was noticeable in the different groups. This is best seen by calculating the relation between the bending (measured as above described,) of the with-grain and that of the cross-grain wood; that is, the same weight being applied (say 100 grs.), by dividing the number given by the lever with the cross-grain piece by that given with the with-grain piece. This relation (called "ratio of deflexion" in the following Table) has, in the first group, the mean value of 1 to 5; in the second, 1 to 8; in the third, 1 to 9·5; in the fourth, 1 to 14. The division of the

groups is therefore also supported from this point of view.* *The difference in the structure in the different directions is least in those woods which show the least difference with respect to direction in their thermoconductive and resonant properties; and the difference in the former is greater or less as the two latter differences are greater or less.*

Hence, a definite relation may be established between the different phenomena described; and this is true to such an extent, that the knowledge of one of them, e. g., *the mechanical or state of cohesion is sufficient to deduce the others, those of warmth or resonance.*

Thus, merely to adduce one example, especial experiments had shown that in petrified woods a difference of structure in the directions parallel with, and perpendicular to, the direction of the grain had been preserved , and, in fact, the thermal curve was an ellipse whose major axis was parallel to the fibres. As in the petrified example, this difference in mechanical structure was much less than in the living wood, so, also, while in the living Conifer the ratio of the axes was as 1 to 1·80, in the petrified specimen it had sunk to 1 to 1·12.

The following Table contains the names of the woods examined, arranged according to the groups mentioned :—

Group I.

Ratio of the axes of the thermal ellipse 1 to 1·25. Mean ratio of deflexion 1 to 5·0.

Acacia.	King wood.
Box.	Satin wood.
Lignum-vitæ.	Salisburia (*Gingko*).
Cypress.	

Group II.

Ratio of axes of thermal ellipse 1 to 1·45. Mean ratio of deflexion 1 to 8·0.

Elder.	Snake wood.
Alder.	Zebra wood.
White Thorn.	Purple wood (*Amaranthus*).
Arbor vitæ.	Settin.
St. Lucian wood.	Coromandel wood.
Gymnocladus canadensis.	Angica wood.
Beech (2 species, white and red).	Cocoa wood (*Gateado*).
Plane.	Apple.
Elm.	Pear.
Oak (two species).	Cherry.
Ash.	Plum.
Maple.	Sandal (red).
American maple.	Caliatour.
Cedar of Lebanon.	Costarica (red wood).
Australian cedar.	Bimas sapan.
Mahogany.	Cuba (yellow wood).
Palisander.	Viset (yellow wood).
Ebony.	Campeachy blue wood.
Palm.	Tobasco blue wood.
Rosewood.	Domingo blue wood.

Group III.

Ratio of axes of thermal ellipse 1 to 1·50. Mean ratio of deflexion 1 to 9·5.

Apricot.	Pernambuco red wood.
Pistachio.	Japan red wood.
Siberian Acacia.	Puerte-Cabello yellow wood.

* The diversity of nature, even with one and the same kind of wood, of course did not admit of the boundaries of the groups being drawn with great exactness, or of the subdivision of the groups into secondary ones.

GROUP IV.

Ratio of the axes of the thermal ellipse 1 to 1·8. Mean ratio of deflexion 1 to 14·0.

Willow (two examples).	Weymouth fir.
Chestnut (three examples).	Magnolia.
Lime.	Iron wood.
Alder.	Tamarind.
Birch.	Palmassu.
Poplar (three examples).	"Kistenholz."
Aspen.	Caoba (Havanna Cedar).
Pine.	Savanilla yellow wood.
Fir.	

*Electro-telegraphic Progress.**

A foreign scientific journal gives the following summary of the different lines where submarine telegraphs have been laid, up to the end of 1858.

Dates.		Length in miles.
1850.	England and France,	$22\frac{1}{4}$
1852.	England and Belgium,	$70\frac{3}{4}$
"	England and Ireland,	64
1853.	England and Holland,	$107\frac{1}{2}$
"	Ireland and Scotland,	$24\frac{3}{4}$
1854.	Italy and Corsica,	64
"	Corsica and Sardinia,	$9\frac{1}{4}$
"	Denmark (Great Belt),	$14\frac{1}{4}$
"	Denmark (Little Belt),	$4\frac{3}{4}$
1855.	Denmark (Channel of the Sound),	$11\frac{1}{8}$
"	Scotland (Frith of Forth),	$3\frac{1}{2}$
"	Black Sea,	$371\frac{1}{4}$
"	Solent (Isle of Wight),	3
1856.	Straits of Messina,	$4\frac{3}{4}$
"	Gulf of St. Lawrence,	74
"	Strait of Northumberland,	$9\frac{1}{4}$
"	The Bosphorus,	$1\frac{1}{8}$
"	Nova Scotia (Isthmus of Canso),	$1\frac{3}{4}$
"	St. Petersburgh and Cronstadt,	8
1857.	Sicily and Algeria,	$149\frac{1}{2}$
1858.	Bay of Valentia (Ireland) and that of Trinity (America),	$1827\frac{1}{4}$
	Total in 1858,	$2771\frac{1}{4}$

* From the Lond. Builder, No. 844.

Use of Birds.

The *Bulletin* of the Brussels Society for the protection of animals, published the following curious and interesting fact:

Until a few years ago, the Park at Brussels was shaded by trees of luxuriant foliage which met over the alleys and screened the promenaders entirely from the sun. These trees were filled with birds whose indiscretions occasioned now and then a little annoyance to the elegant toilettes below. For this reason they were banished; in a few weeks, the

leaves of the trees were in holes and dying—and now, the branches almost entirely without verdure, and loaded with caterpillars, and the walks infested with moths. *Cosmos.*

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*On Professor Hughes' System of Type-printing Telegraphs and Methods of Insulation, with special reference to Submarine Cables.** By Mr. H. Hyde.

The several phenomena which have been manifested in the working of long submarine telegraph cables, demonstrate the necessity of improving the insulation of the wires, and of economizing the transmission and recording of symbols. Imperfect insulation not only implies a diminution of the electric current, but may, and frequently does, increase to a total loss, and the cable becomes useless.

The insulation being good when the cable leaves the manufacturer, it is subject to so many accidents before it reaches the bottom of the ocean, that the chances are greatly in favor of a long line receiving some damage, which cannot be repaired after it is laid down. More perfect insulation, and a self-restoring power which should make the cable itself, even at the bottom of the ocean, repair any accidental defect, are most important desiderata in the science of ocean telegraphing.

The great expense of a length of cable, of any construction, sufficient to join England and America, must necessarily be such as to render economy of time in the transmission of messages a matter of primary importance.

Through a single wire, the waves of the electric force can only follow one another in single file. Whatever may be the time occupied in the transmission of a single wave, it is of no small importance, whether it takes from five or six, or only a single wave, to communicate the signal of any letter of the alphabet. The short experience of the working of the Atlantic cable has demonstrated the importance of these positions. I need therefore offer no apology to the members of the Society of Arts, for bringing before them the methods by which Prof. Hughes seeks to improve the insulation of submarine and other wires, to render them self-repairing, and to economize and render at the same time the means of despatch accurate and self-recording.

First—Insulation.—Gutta-percha has been found to be the best insulation for long submarine lines. This substance, however, is more or less porous; minute flaws may exist, which do not show themselves until some time after the immersion of a cable. This was exemplified by Mr. Henly, who discovered a flaw in his submarine cable, which did not show itself until it had been three or four days under water. To meet these defects, to fill up any minute pores in the gutta-percha, and also to cure any accidental fracture or puncture of it, Prof. Hughes introduces a viscid semi-fluid substance, of a non-conducting character, between the conducting wire and the gutta-percha, or the wire may be first coated with gutta-percha, and the viscid fluid introduced between the layers of gutta-percha. As soon as a puncture is

* From the Jour. of the Society of Arts, No. 321.

made in either of the gutta-percha coatings, the semi-viscid fluid oozes out. It is of such a nature, that it hardens when it comes in contact with the surrounding water.

This hardening or coagulating property allows no more of the fluid to ooze out than is necessary to fill the fracture, and at the same time to glue and unite the separated parts of the gutta-percha.

The first feature in this form of cable is its self-restoring power; but it has another, and perhaps more important one. It has been shown, I think by Prof. Faraday, that a fluid which cannot be decomposed by electricity is the most perfect insulator. Should this be demonstrated in practice, the invention of this form of cable must be valuable as a means for greatly increasing the non-conducting power of the medium surrounding the conducting wire. It is well known that cables become defective in insulation after being submerged for some time. It has been supposed that the forces of the electric current burst the gutta-percha covering under certain circumstances. It has also been urged that, in consequence of this tendency, battery power should be used instead of induced currents.

Professor Hughes has demonstrated that voltaic currents exert no mechanical force whatever upon the insulating coating of a conducting wire.

If there be a defect in the coating it may be enlarged by strong currents, either voltaic or induced. But, if there be no pore or crack through which the current can first commence its work of destruction, no voltaic current would exert sufficient force to tear a piece of paper. This has been shown by putting a piece of cable, three feet long, made upon Prof. Hughes's plan, into a bath of salt water. Its complete insulation was tested by a delicate galvanometer and a battery of 500 cells. A fracture, an inch long, was then made through the gutta-percha and the viscid substance, allowing the salt water to reach the wire; the galvanometer immediately was deflected from zero to 90°, showing dead earth.

In the course of five or ten minutes the viscid substance worked its way around the uncovered wire, and oozed out to the water through the fracture. It then coagulated, and thus repaired the injury, and completely restored the insulation. The whole force of the current from the 500 cells was kept constantly passing into the wire during the whole of this operation.

In illustration of the varied effects of different descriptions of fractures upon submerged cables, it may be instructive to note that if the conducting wire be made bare by a fracture of considerable size, having breadth as well as length, the immediate effect will be dead earth, or the instantaneous deflexion of the needle to 90°. If the fracture be fine or narrow, the effect will be a deflexion of the needle to a greater or less extent, say from 70 or 90°, with a constant vibration of from five to ten degrees or even more. This deflexion and the vibrations will continue as long as the current is kept upon the wire, and often resemble the vibrations produced by a manipulator. This peculiar phenomena may, in some degree, account for the peculiar vibra-

tions which so much puzzled the electricians during the short life and last moments of the Atlantic cable. These vibrations are probably produced by the decomposition of water by the electric current. The hydrogen gas escaping from the point of contact with the wire in an elongated bubble fills the fracture while passing through it, thus alternately opening and closing the circuit.

Secondly—Instruments.—In the early history of electric telegraphing, inventors were impressed with the advantages of using the alphabet in general use for transmitting communications, instead of characters or symbols, a mode which naturally suggested itself as the best, if practicable.

While electrical knowledge was confined to but few, mechanical knowledge, as applicable to its development, was also limited in the same or a still greater ratio. Hence, the mechanical means by which electric currents were made to convey or record signals were crude and simple, and the work was, if not cheaply, at least slowly, roughly, and often inaccurately done.

Among the earliest applications of electro-magnetism to telegraphic purposes, was the vibration of a magnetic needle to the right or left, at the will of the operator, by passing an electric current through the apparatus, or around the needle.

These vibrations are arranged into a code of signals, and the receiver spells off the message from the moving needle, and translates the signals to an amanuensis, who commits them to paper. But in the event of errors by this process, there is nothing to show whether the sender's hand was correct, or the receiver's eye undeceived, or the copyist's ear unerring, or, if a difference arises between them, the evidence may be equally in favor of each. To ascertain who is in fault is difficult, the instrument being visual or non-recording. This primitive method is now generally used in Great Britain. On the Continent, however, Morse's self-recording instrument is generally used.

The main features of this instrument consist in making a temporary magnet of a piece of soft iron, by passing a current of electricity through it, attracting an armature attached to one end of a lever, thus pressing a stile upon the other end against a strip of paper moved by clockwork at an uniform rate of speed. By this means the manipulator is enabled to record, both at the home and distant stations, symbols, consisting of short and long lines, with blank spaces. These hieroglyphics are transmitted by the receiving clerk, written out, and enclosed to the person for whom the message is intended.

The Morse instrument is used upon many of the American lines. A roman type-printing instrument, the invention of Mr. House, is also used to some extent in America. It is more rapid than the Morse, printing accurately twelve to fifteen hundred words an hour in ordinary working, and is therefore approved upon lines which have a great amount of business.

It is, however, more complicated than the Morse or the Hughes instruments, and requires an immense battery power to work it, so much so that it is not practicable, upon the best air or overground lines, for

circuits of more than 150 miles, while upon underground or submarine wires it has not, and I believe cannot, be worked thirty miles.

The House instrument is based upon the step-by-step motion, or that the number of waves sent shall determine the letter to be printed. The type is made to revolve by means of a treadle, but is checked at each letter by an escapement, which only allows it to move one letter at a time.

This escapement is moved by the flow of compressed air upon alternate heads of a plunger. The passage of air is governed by a valve attached to the armature of the axial electro-magnet, each wave of the voltaic current causing an action of the magnet, and consequently of the plunger and escapement, by the air force.

Compressed air is used to get greater power on the escapement, as the electric current would be too weak to move the escapement, whilst sufficient to move the armatures and valve. In the transmission of a message, the operator sending it, checks a circuit breaker at a certain number of waves, and this stops the type-wheel of the distant instrument by means of the escapement; and, as soon as stopped, a press is unlocked, which imprints the letter.

This unlocking of the press is very ingenious, its action depending on the motion of the type-wheel. The main constituents of this instrument are the transmitting apparatus, a compound axial magnet, and a manual power by which the instruments are kept in motion.

The instruments thus concisely described, as well as all minor ones hitherto worked with one wire, require an average of five or more electrical impulses or waves, or the time equal to this number, to transmit one letter.

The recording in roman type each letter of a message by a single wave, upon one wire, is the triumph of the Hughes system. To accomplish it, several requisites are necessary, which it may be proper to state, and then proceed to show how they are each obtained, and, united in one harmonious whole, producing that life-like automaton present to demonstrate before you what is advanced, and practically speak for itself in plain English.

These requisites are, first, synchronous motion; secondly, an electro-magnet, by which the timing of the electrical wave may be accurately measured; thirdly, a writing apparatus, by which the message may be correctly, rapidly, and easily transmitted; fourthly, a printing apparatus, by which the operator can record the message unerringly upon his own instrument, as well as upon the one at the distant station.

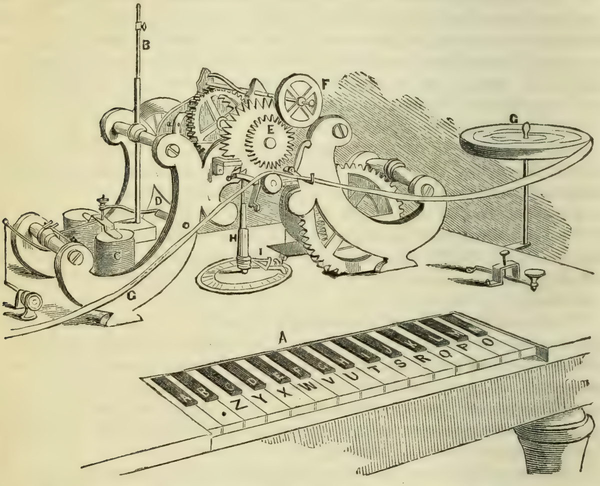
Many inventors have attempted to make an instrument, by which a letter could be sent by one wave, but without success. One reason was, that they had no governor of sufficient velocity and accuracy, to produce rapid synchronous motion.

Prof. Hughes applies a vibrating spring to govern his instrument. It is a well known law that a certain number of vibrations produces a certain musical tone; therefore, if two or more springs have the same tone they must necessarily have a similar number of vibrations in the

same time. The instruments are kept in motion by a weight acting upon a train of wheels, the spring governor acting upon them by means of an ordinary escapement.

These vibrations may succeed each other with any degree of rapidity required. They are regulated by a small weight attached to the spring, and raised or lowered until the number of vibrations or desired tone is produced. This can be done easily and quickly, although the instruments may be any number of miles apart—say between London and Paris, or Ireland and America.

The type-wheels of the instruments now exhibited, revolve at the rate of one hundred and twenty revolutions per minute, and the governor makes fifty-six vibrations for each revolution of the wheel.



A. Key Board. | D. Detent. | G. Paper Printed upon.
B. Vibrating Spring. | E. Type-wheel. | H. Revolving Shaft.
C. Electro-magnet. | F. Ink Roller. | I. Revolving Arm or Circuit Closer.

The Magnet.—The Hughes magnet is of peculiar construction. A permanent magnet polarizes the cores of an electro-magnet, and holds an armature in contact with its poles. A spring is attached to this armature, and so adjusted as to exert a counteracting power a little weaker than the force of the magnetic attraction. If, therefore, the magnetic force be diminished, the armature is removed from the poles of the magnet by the force of the spring.

The arrangement is such that the current of electricity passing through the coil when the circuit is completed, induces an opposite magnetism to that of the permanent magnet. The electrical force,

therefore, which works this instrument, need not be sufficient to induce such a degree of magnetism, as to render the core sufficiently magnetic to attract an armature to its poles—the practice in all other recording telegraphs. For instance, if the cores of the electro-magnet, polarized by the permanent magnet, have a holding force upon the armature of ten, and the spring attached to the armature be adjusted with an opposing force of nine, then a current of one reducing the force of the electro-magnet, would cause the spring to rise with the force of nine.

This arrangement can in practice be so nicely adjusted as to work with a very feeble current, and accurately measure the timing of the electrical wave. The armature being mechanically restored to contact with the poles, has the advantage of being acted upon by the maximum power of the electro-magnet, instead of a power lessened by more than the square of the distance the armature has to be attracted, as is the case in the relay magnets used in connexion with the Morse and other systems.

Transmitting Apparatus.—The letters of the alphabet, as well as a dot and a blank, are marked on twenty-eight keys, arranged like those of a piano, save that they are alternately black and white. These keys correspond to twenty-eight holes arranged in a circle on the horizontal floor or table of the instrument, immediately in front of the keys. Each key is connected by a lever with a little steel knob, which, when the key is pressed down by the finger, rises up through one of the holes. An arm, connected with a vertical shaft, sweeps over the twenty-eight holes. If a key marked with a particular letter be touched, the knob corresponding with this letter rises, the revolving arm passes over it, and for the instant closes the circuit, and allows an electrical impulse to be transmitted. This impulse, by arrangements which will be described in the printing apparatus, causes the particular letter to be recorded on a slip of paper in printer's ink. The instant the arm passes over the little raised knob the circuit is broken, and if the finger were held a hundredth part of a minute on the key, the hand would pass again over the knob, and the letter would be repeated. To prevent this, the hand carries, after the portion of it which rides over the knob and completes the metallic contact which closes the electrical circuit, a little inclined plane, which throws the knob out of its position, so that the hand cannot pass over it on any future revolution after the first contact. This arrangement is rendered necessary to prevent the repetition of letters, on account of the extreme rapidity of the revolving arm and recording apparatus.

Printing Apparatus.—A shaft, which revolves seven times faster than the type-wheel, has a fly wheel upon it to overcome the inertia of a small shaft which moves the printing press. This shaft is locked to the fly-wheel shaft by means of a clutch, which rests upon a small inclined plane. Whenever this clutch is kept upon the inclined plane, by means of a detent, the fly-wheel shaft revolves independently of the small printing shaft; but as soon as the detent is moved by the

action of the armature of the electro-magnet, the clutch locks both shafts together, and the small shaft is made to revolve one revolution, when the clutch again rests upon the inclined plane, which lifts it off the fly-wheel shaft. A cam is attached to one end of this shaft, which lifts the press and the paper upon which the message is to be printed against the type wheel. The time of the locking of the shafts depends upon the arrival of the electrical wave, and thus, with two instruments in perfect harmony, the operator has the printing apparatus of the distant instrument as completely under his direction as the one before him. But to correct any minute variation in time between the instruments in circuit, there is a corrector, or wheel, attached to this shaft, with hook-shaped teeth, which mesh into corresponding cavities in the type-wheel. The latter being loose upon the shaft, or only held by friction, is removed backwards or forwards by the corrector to exactly the same position as the type-wheel on the instrument from which the message is being sent. This corection takes place in the act of printing every letter. There is also upon this shaft a cam, so arranged that, the moment the armature falls off the electro-magnet and opens the detent, it forces the detent up, and restores the armature to its original position upon the poles of the magnet.

Another new feature in this instrument, is its power of cutting off at will all offices except the one to which it is desired to communicate. This is accomplished by a flanch on the type-wheel—this flanch having a space cut out opposite a certain letter, and each office having the flanch cut out at different letters from each other. A bolt is made to slide through the space, and moved through by the action of the instrument. If this bolt is sent through at the moment the space is opposite, it permits the instrument to run, if not it goes against the flanch and locks the type-wheel.

The operator, knowing at what letter a certain instrument will be unlocked, touches that key. This allows the instrument he wishes to communicate with to run; and he can send the message to that one, the other offices being unable to get it, as they would be locked, and could not bring their instruments into unison with the one sending the despatch. Thus, it is absolutely secret in its transmission, and if necessary, any one could send his own message, as it is only necessary, to ensure its safe arrival, to touch the right keys, which are all lettered.

The electrical circuits are extremely simple. The earth-wire connects with the steel pins or knobs on the keys of the transmitting apparatus, and from the revolving arm through the electro-magnet, and thence through the line and distant magnet to the earth. Reversed currents are not necessary, except on long submarine wires. There may be as many instruments in circuit as may be desired. The European news, consisting of about 3000 words, by the arrival of each Transatlantic steamer, is transmitted by this instrument from Boston to New York, a circuit of about 300 miles, at the rate of 2000 to 2500 unabbreviated words an hour. There are 25 stations on the circuit which receive copies of the news, all of which are printed in plain Roman type by the Boston operator, all the instruments receiving the

message at the same time, the receiving clerks at each station having simply to hand the copy as it arrives to the party entitled to receive it.

The mode of operating with this instrument is extremely simple, and easily acquired. The office desiring to transmit a message calls the station by touching the keys in a pre-arranged order, the distant office at once returns the signal "O K.," or all right. The manipulator then commences the message, first striking the zero key to start the distant type-wheel in unison with his own. If the message is received correctly he is allowed to finish, and then the operator at the distant office gives the return signal of all right; if there is a mistake the receiving office touches his key board, which throws extra letters to the transmitting station, and he then commences again from the point where he made a mistake. There can be no mistake, however, if the operator touches the right key, and manipulators become so expert that they seldom touch the wrong one; if they do, the error is shown by the copy of the message on their own instrument, and immediately corrected.

If I have succeeded in conveying a clear and intelligible impression of the principle of the Hughes system, it may be proper to invite your attention to what appear to me to be natural deductions.

Accuracy is secured by unerring mechanical laws, and not by the skill of the operator, as in the needle or Morse systems. Not only this, but in all other systems, if one of the symbols be missing, another letter is formed by the remaining symbols. *Rapidity* is secured by reducing the labor to its minimum. A single touch of the key prints the letter, instead of three or four vibrations of a needle, or a similar number of motions of a key, as in the formation of symbols to represent letters. Accuracy and rapidity being thus secured, ease and simplicity of manipulation must of necessity follow, and consequently the young operator readily acquires his or her education. The instrument however, is specially adapted to females.

The one-wave system is specially important on long submarine circuits, where electrical impulses are limited, one wave being sufficient for a letter instead of five. Great difficulty has been experienced on long cables by the variation of time in the transit of the wave. By this correct timing instrument, simple and perfect compensation is mechanically attained for any length of wire or extent of variation. The sensitiveness of the magnet also enables this instrument to record more waves upon a long circuit than any I have yet met with. The rapidity of an instrument, however, does not consist only in the fact of its extreme sensitiveness, but also in its power to free itself from the influence of a current so soon as the effect of the current has caused the instrument to record the signal or letter sent. This property, attained by the electrical and mechanical combination of scientific laws, embodied in the design and construction of the instrument, and demonstrated by the results produced, must in time remove all doubt of its superiority, while its English tongue represented in plain printed Roman characters, will tend to make it the favorite of the Anglo-Saxon race.

(To be Continued.)

*On the Practical Bearing of the Theory of Electricity in Submarine Telegraphy, the Electrical Difficulties in Long Circuits, and the Conditions requisite in a Cable to insure rapid and certain communication.** By S. ALFRED VARLEY, Assoc. Inst. C. E.

Since the practical realization of the electric telegraph, several valuable communications connected with the subject have from time to time been laid before this Society.

These papers have generally treated of the mechanical details and improvements in the apparatus which have been designed and brought forward by various patentees and inventors.

In the course of the discussions which have taken place, it has appeared to me that the principles of the science of electricity have not always been sufficiently appreciated, and the practical value of many of the beautiful contrivances not elicited, from not having determined clearly the principles of the science which are involved in telegraphing, and, consequently, the properties which are essential, and must be possessed by all apparatus, to give them a practical value.

This feeling has led me to think that a paper on the Theory of Electricity, keeping always in view its bearing on electric telegraphy, and which should rather treat of the principles of telegraphic apparatus than confine itself to special contrivances, would be subservient to the progress of the object we have in view; for it must not be forgotten that although the world is always indebted to the practical man for the application of science to commercial purposes, and, in the case of the electric telegraph, it is even questionable whether we are not indebted for its very rapid extension in part to the inability of the projectors to appreciate difficulties which the philosopher foreseeing would have hesitated at—or, perhaps, to the greater faith possessed by the practical man in the ability of science to overcome whatever difficulties may present themselves; yet it must not be forgotten that, in the principles of a science, the philosopher is often far ahead of the practical man, and the latter at times comes suddenly and unprepared upon difficulties, which, had he understood correctly the principles long before developed by science, he would have been led to expect as natural consequences. As an example of this, I would mention the case of electric induction, which manifested itself so strikingly when the system of subterranean circuits was considerably extended on the introduction and successful manipulation of gutta-percha.

This phenomenon was unexpected and unlooked for by many, though not all, of our practical electricians; and we find it referred to, and regarded at the present time, as a new fact which the electric telegraph has brought to light, and not one to have been anticipated; yet the laws of induction were beautifully and clearly developed by Dr. Faraday, as far back as 1838; and, when called upon to examine this new telegraphic difficulty, we find him alluding to it in an instructive lecture, delivered before the members of the Royal Institution, as a

* From the Jour. of the Society of Arts, No. 332.

strong confirmation of the truthfulness of views he had put forth as far back as 1838. I would direct attention particularly to this, because I cannot help feeling that our progress is too often obtained by a laborious perseverance in almost empyrical experiments, until, by the laws of chance, a successful result is hit upon, instead of endeavoring, in the first place, to develop a guiding principle, and referring back to it, as each step forward is made, to test both the truth of the principles laid down, and the correctness of the conclusions arrived at. Were this done, experience would not be paid for so dearly; and the commercial application of a science would not be almost paralyzed, as it sometimes is on its first introduction, by the costly series of experiments which have to be gone through before correct principles of working are established.

During March, 1858, the subject of telegraphic cables was very fully entered into by the Institution of Civil Engineers. Finding at that time there were no papers on the electrical portion before the Institution, and feeling that the subject could not be fully considered without the electrical part being entertained, I was induced at the eleventh hour to attempt to supply the deficiency. Some explanation is perhaps therefore due from me for bringing forward, so shortly afterwards, another paper on almost the same subject. Owing to the large number of evenings which had already been occupied in the consideration of the mechanical portion of the problem, and the late hour at which my paper was submitted, it was only read in abstract, and no discussion taken upon it. The views, too, I then brought forward were opposed to some which have lately been laid very prominently before the public, and no opportunity given to contradict them, or to verify their correctness; and as I am convinced that so far from the subject being exhausted, its importance is only now beginning to be appreciated, the opportunity having been offered to me to bring the matter before the Society of Arts I determined to avail myself of it.

The complete way in which the subject was taken up by the Institution of Civil Engineers is, however, I am glad to say, already bearing fruit; and since the publication of the papers by the Institution, several valuable discussions have taken place in the scientific journals, and in some of the remarks I have to lay before you to-night, I find, to a certain extent, I have been anticipated.

The generally recognised theory of electricity, as I understand it, supposes all bodies in their normal condition to have two powers or forces resident in them directly opposite in their character, being exactly balanced; in bodies in their natural state these forces are completely neutralized and rendered inactive, producing the ordinary condition of matter.

To these powers the name of electricities has been given, and although we are still as ignorant at the present day as the ancients themselves with regard to what electricity actually is, yet the fact of the existence of the electric telegraph is a proof of the progress which has been made in a knowledge of the laws, at least, which govern electric phenomena.

In the year 1838, Dr. Faraday clearly developed the principles of induction and conduction, since which time no further progress has been made in the fundamental truths of the science, though much has been done to confirm their correctness and to develop their consequences.

In the *Philosophical Transactions* for 1838, will be found Dr. Faraday's views on the subject of induction and conduction; and these, to my mind, so clearly explain all electric phenomena, that it will be as well at once to refer to them before proceeding further. After giving reasons for his belief in the identity of induction and conduction, he says, "all these considerations impress my mind strongly with the conviction that insulation and ordinary conduction cannot be properly separated when we are examining into their nature, that is, into the general law or laws under which their phenomena are produced. They appear to me to consist in an action of contiguous particles dependent on the forces developed in electrical excitement; these forces bring the particles into a state of tension or polarity, which constitutes both induction and insulation, and, being in this state, the continuous particles have a power or capability of communicating their forces one to the other, by which they are lowered, and discharge occurs. Every body appears to discharge, but the possession of this capability in a greater or smaller degree in different bodies, makes them better or worse conductors, worse or better insulators, and both induction and conduction appear to be the same in their principle and action, except that in the latter an effect common to both is raised to the highest degree; whereas in the former it occurs in the best cases in only an almost insensible quantity."

In part the 2d of the *Philosophical Transactions* of the same date will be found a summary of Dr. Faraday's views, which I will also quote:—

"1st. The theory assumes that all the particles, whether of insulating or conducting matter, are, as wholes, conductors.

"2d. That, not being polar in their normal state, they can become so by the influence of neighboring charged particles, the polar state being developed at the instant, exactly as in an insulated conducting mass consisting of many particles.

"3d. That the particles when polarized are in a forced state, and tend to return to their normal or natural condition.

"4th. That being, as wholes, conductors, they can readily be charged either bodily or polarly.

"5th. That particles which, being contiguous, are in the line of inductive action, can communicate or transfer their polar forces one to another more or less readily.

"6th. That those doing so less readily require the polar forces to be raised to a higher degree before this transference or communication takes place.

"7th. That the ready communication of forces between contiguous particles constitutes conduction, and the difficult communication insulation; conductors and insulators being bodies whose particles naturally possess the property of communicating their forces easily, or

with difficulty, and bodies having these differences as they have differences of any other natural property.

"8th. That ordinary induction is the effect resulting from the action of matter charged with excited or free electricity upon insulating matter, tending to produce in it an equal amount of the contrary state.

"9th. That it can do this only by polarizing the particles contiguous to it, which perform the same office to the next, and these again to those beyond; and that thus the action is propagated from the excited body to the next conducting mass, and these render the contrary force evident in consequence of the effect of communication which supervenes in the conducting mass upon the polarization of the particles of that body.

"10th. That, therefore, induction can only take place through insulators; that induction is insulation, it being the necessary state of the particles, and the mode in which the influence of electrical forces is transferred or transmitted across such insulating media."

To determine for myself the law which induction obeys, in conjunction with my brother, Mr. C. John Varley, I have tried some experiments.

The principle upon which these were based was that of the dual character of electricity, and the fact established by Dr. Faraday, that all statical charge is sustained solely and entirely by induction.

In bodies in their normal condition, the opposite forces or electricities being balanced and united, no attraction for neighboring particles exists, but when these forces are separated, as in the case of a Leyden jar, the attraction which a given quantity of electricity exerts for the similar amount of negative on the opposite coating, will be less in proportion to some law as the thickness of the dielectric intervening is increased.

It was therefore assumed that the amount of free attraction under these circumstances, or more correctly the amount of induction which would be thrown upon neighboring bodies, would increase inversely as the attraction between the opposite coatings diminished.

The apparatus made use of was constituted in the following way:—A glass pillar, varnished, for better insulation, was mounted upon a board. On the top of this a brass plate was attached, and upon this plate the dielectric to be examined was laid. Over the dielectric another brass plate was then placed.

A Leyden arrangement was thus constructed, the upper and lower brass plates representing the inner and outer coatings of an ordinary Leyden jar.

A brass ball, suspended from a balance which had an adjusting arrangement, so that it could be raised or lowered, hung over the upper metal plate at a short distance from it.

The *modus operandi* was as follows:—The upper brass plate was connected to the earth, and a series of sparks, through the medium of a sliding rod kept at a fixed distance from the prime conductors of a frictional machine, thrown into the lower brass plate of the Leyden arrangements, or the prime conductor was kept fully charged, and a

carrier ball attached to a long glass rod was made use of to measure out definite quantities of electricity.

The room in which the experiments were performed, was heated with a stove, and the dryness of the atmosphere indicated by a hygrometer, so that the insulation might be as perfect as possible. When a certain number of sparks had been thrown into the lower brass plate, the upper brass plate was disconnected from the earth, and the lower one attached to the balance, and if the tension of the charge was sufficient, the brass ball suspended from the balance was attracted down, and discharge ensued. The experiment was repeated again and again, and the number of sparks requisite to just attract the ball down, noted.

Glass plates were the dielectric employed, and the experiment was tried first with one plate, then with two, and then with three plates of glass between the upper and lower brass plates, the brass ball suspended from the balance being kept always at a certain fixed distance from the upper brass plate.

The results obtained from a numerous series of experiments were—that when two plates of glass were placed between the brass plates, only half the number of sparks which were required to raise the tension of charge sufficiently to cause discharge when one plate of glass separated the brass plates was requisite, and when three plates of glass divided the upper and lower brass plates, then a third of the number of sparks raised the charge to the same degree of tension, showing that through flat plates of glass, induction decreases in the inverse proportion to the thickness of the dielectric, that is to say, if the induction through one be 12, through 2 it will be 6, through 3—4, and so on.

In the case of a gutta-percha covered wire, it was anticipated that as when the thickness of the gutta-percha is increased, the outer surface increases at the same time, the decrease of induction consequent on the increased thickness of the insulating material would not be inversely proportionate to the depths of the gutta-percha, but would follow some other law. To put this to the test, a series of Leyden arrangements were constructed in the following way: three pieces of tube, of half an inch internal diameter, and 2 feet 6 inches long, were placed in the centre of tubes of 2 feet long, the internal diameters of which were 1 inch, $1\frac{1}{2}$ inches, and 2 inches, and the space between the inner and outer tubes filled with melted resin. (Figs. 1, 2, 3.)

Fig. 1.

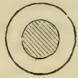


Fig. 2.

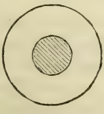
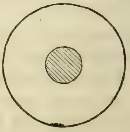


Fig. 3.



By this means three Leyden arrangements, with a uniform internal surface, but whose insulating material varied in thickness in the pro-

portion of 1, 2, and 3, were constructed, and the same process as that already described with the flat plates was repeated.

The results obtained are shown in the annexed table:

Diameter of Inner Tube.	Thickness of Insulation.	Diameter of Outer Tube.	Inductive Force.
10	5	20	22
10	10	30	15·5
10	15	40	11·5

These results were very constant, but as resin was the only dielectric employed, the experiment requires repeating with other dielectrics, for there is reason to believe that with glass at least the decrease in induction consequent on an increased thickness of the dielectric would be somewhat greater than that indicated in the above table.

The reasons for this belief are the following:—When a galvanic battery is connected with the inner and outer coatings of a Leyden arrangement, induction will take place through the dielectric, and if the surfaces of the two coatings are equal, then the force will be equally divided over them; that is to say, if the battery force be 100, the tension of the charge on the one coating will be 50, and that on the other will be 50 also, =100.

Let the surface of the outer coating be supposed to be infinite in extent, then the tension of the charge on the inner coating will be almost nil. An example of this we have when the earth represents one of the coatings of a Leyden arrangement; and this is the case in the prime conductor of a frictional machine, and also in the suspended wire of a telegraphic circuit; in these two examples the prime conductor of the machine and the wire of the telegraphic circuit represent the one coating, the air the dielectric, and the earth the other coating.

Now consider a case where the outer surface is double that of the inner one, the tension of the charge on the inner coating will then be double that of the *outer;* an example of this we have in the above table, where the inner surface is 10, the thickness of the insulation 5, which may here be regarded as unity, and the outer surface 20—the battery force being 100. Divide this into three parts, and we get $33\frac{1}{3}$. Give two parts for the tension of the charge on the inner coating, and one part for the tension of the charge on the outer coating, then we shall have for the tension of the inner surface, $66\frac{2}{3}$; for the outer surface, $33\frac{1}{3}$, =100 when united.

Now, consider the third example in the above table. Inner surface 10, thickness of insulation 15, outer surface 40, or quadruple that of inner surface. In this case the tension of charge on the inner surface will be four times that of the charge on the outer surface. In other words, the tension of the charge on the smaller surface will be 80, and that of the outer surface 20, the united tensions equaling 100; but the thickness of the insulation is 15, or three times that of the first example; and it has been shown that induction decreases in the in-

verse proportion to the thickness of the insulating material; we shall, therefore, have to divide by 3, and this will give 26·6 for the tension of the charge on the inner surface.

In the first example it has been shown that if the force be 100, the tension of the charge on the inner surface will be 66⅔, which, to avoid fractions, we may regard as 67. In the actual experiment the inductive force measured was 22; 67, therefore, represents 22, and as 67 is to 22 so should 26·6 be to the amount of force which would be expected to be obtained in the last example; this, when calculated by a simple Rule of Three sum, gives 8·8 for the amount of inductive force. In the actual experiment the force obtained was 11·5, a result, therefore, sufficiently near to warrant further investigation, to ascertain whether the law which would seem to be indicated is correct, and whether it holds good with any other dielectric, such as glass, in which case the cause of the discrepancy, when resin is the dielectric employed, should be sought after.

I now proceed to conduction.

The law which governs the conduction of electricity has been very accurately ascertained, and would seem to follow the same law as induction, that is to say, if the sectional area be uniform throughout, the resistance which a conductor will oppose to the passage of a current will be directly relative to its length; or, the length of the conductor being determined, the resistance will be relative to its sectional area. In other words, a wire one mile long will oppose half the resistance of that which will be opposed by a similar wire two miles long; and two wires, each two miles long, placed side by side, which is the same thing as one of twice the sectional area, will oppose exactly the same resistance as a single wire one mile long.

The next thing to be considered is the part which the quantity and intensity of electric currents play in electric phenomena.

The amount of force developed by an electric current, whether it be the deflexion of a needle, the attraction of an armature in an electromagnet, or the decomposition of water, is always relative to the dynamic quantity flowing.

This fact has been well established, and the difference between quantity and intensity accurately defined; yet still, in practice, there is a want of a clear comprehension of the relationship of those terms.

Let a battery—say of ten pairs of elements, with ten inches of surface in each cell—be joined through a circuit perfectly insulated, and opposing very great resistance to the passage of the current, and the amount of force, or in other words, the dynamic quantity of electricity flowing, be weighed off by a magnetometer, and noted down. If now this battery be disconnected, and another of the same number of elements, but with twice the surface, be connected in its place, practically no more will be found to be flowing through the circuit than in the former case, the resistance which the wire opposes measuring out the quantity passing somewhat in the same way as the height of the column, and not the quantity of water in a cistern, regulates the rate at which it flows from an orifice inserted in it.

Let the series be increased, and more will be urged through ; and, if the number of cells be sufficiently numerous for practical purposes, the same dynamic quantity as a single cell would generate through a circuit of no resistance, will be found to be flowing.

In theory this point can only be approached, for the resistance of the wire can never be completely overcome. In theory, also, when the number of elements is not increased, the larger the surface the greater will be the dynamic quantity flowing, for the tension of the current is lowered in proportion to the amount of electricity flowing out of the battery ; and, when drawing from a larger reservoir, which batteries of greater surface may be compared to, this same amount will not lower so much the general tension ; consequently, there will be more intensity to urge the current through. But to return to practice. If the number of cells has been sufficiently extended so as to generate the same dynamic quantity as a single cell does through a circuit of nominally no resistance, a further addition to the series will not be attended with any beneficial effect, for there is already power enough to urge through all the electricity the battery is capable of generating; and the force developed is directly relative to the dynamic quantity flowing. Tension is only the medium by means of which this dynamic quantity is forced through the circuit.

It will be as well, perhaps, to define more precisely what is wished to be understood by the term resistance. When it is said that one circuit opposes twice the resistance of another, it is meant that the same tension of current will force half the dynamic quantity only through this circuit that it would through one opposing half the resistance ; it follows that a given length of wire opposes the same resistance to half the dynamic quantity of electricity that half this length of wire does to double the dynamic quantity, and hence all circuits oppose to an infinitely small quantity of electricity an infinitely small amount of resistance.

The way in which quantity and intensity affect practical telegraphing has next to be considered, and whether there be any advantage in employing comparatively large over smaller dynamic quantities of electricity.

It may be generally stated that when the insulation is very perfect there is no great difficulty in working with minimum quantities ; but when the insulation is imperfect, larger dynamic quantities hold out a better prospect of working through.

When a current is flowing through a circuit which offers, practically speaking, no resistance, let the cells of the battery be ever so numerous, it will possess no intensity worth noticing, for, as there is no resistance opposed to the force resident in the battery, the intensity is not brought into play. It is something like a powerful engine raising a light weight, the force is latent, but not brought into action.

Let the battery, however, be connected through a circuit opposing considerable resistance ; its intensity will then be developed.

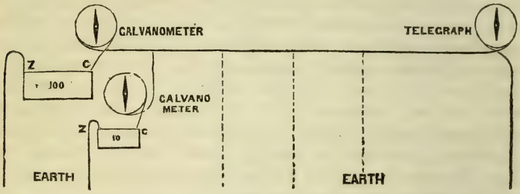
Let the diagram (fig. 4,) represent a circuit which fulfills these conditions, one end of the wire dipping into the earth in the usual way, and the other connected with the copper pole of a battery composed

of a numerous series of elements possessing very little surface, and, consequently, capable of generating only a small dynamic quantity of electricity, and let the circuit be completed by connecting the zinc pole to the earth.

The current will flow from the copper pole through the wire, thence to the earth, and back to the battery, and its working intensity will be dependent on the resistance which the circuit opposes, and can be measured in the following manner:—

Let another battery, but with a much smaller number of elements, be connected side by side with the larger battery to this wire, the zinc

Fig. 4.



pole being connected to the earth and the copper to the wire, and introduce galvano-meters in the circuit, between the large battery and the wire and between the small battery and the wire, so as to indicate the direction in which the currents are flowing.

Both batteries will desire to send a current through the circuit in the same way, but should the small battery oppose much less resistance to the passage of a current through itself than is opposed by the long wire, then the greater quantity of electricity generated by the large battery will pass that way in preference to through the wire, and paralyze the action of the smaller battery; but if cell after cell be added to this little battery, when its intensity becomes greater than the resistance of the wire, a current will flow from it also in the same direction as that from the large battery through the wire, and the number of cells requisite just to do this will be an exact measure of the working intensity of the current.

Let the case now be considered where the insulation is not perfect; if there be sufficient leakage to let the small dynamic quantity, which the battery can only generate, escape on the road, no appreciable amount will reach the further end, the tension of the current will be lowered, and a less number of cells in the little battery will now be found to balance it.

Adding to the number of these small pairs of elements will not give any appreciable assistance, but let the surface in each of the cells of the larger battery be increased so that a greater quantity may be generated than can escape through the leaks, represented in the diagram by the dotted lines, an appreciable amount will then reach the further extremity, and the telegraph instrument be rendered active. In such a case as this, adding quantity will raise the working intensity of the

current, whilst increasing the intensity of the battery alone will scarcely affect it.

In some experiments tried by my brother, Mr. Cromwell Varley and myself, on long leaky circuits, increasing the surface of the batteries alone, without adding to the series, raised the deflexion on the galvanometer from 22° to 53°; and the last intelligible words uttered by the Atlantic cable, "Daniells are now in circuit," is a further testimony of the correctness of what has just been advanced.

(To be Continued.)

For the Journal of the Franklin Institute.

Fog Signals by Sounds.

Musical phrases are used in armies to direct the movements of men, but no advantage is taken of them to convey information beneficial to vessels navigating in a fog or on dark nights. We have steam whistles, bells, gongs, and horns, to make unmeaning noises. Why cannot a regular system of phrases or sounds be introduced showing which way a vessel is heading to avoid collision, &c.? Only two musical intervals would be required, say an octave or a fifth, to communicate any information wanted. When it has been suggested, the reply has been, "we do not understand music." A knowledge of music is not necessary; when we hear the sound of the bird whistling "Bob White," we know what bird it is, and this interval, alone, introduced on board of our river steamers would be invaluable; for "Bob White" being the upward bound craft, and "White Bob," or the descending interval, the downward, they could port their helms or stop their engines, as circumstances required. E. B.

Brooklyn, April 14, 1859.

The suggestion of our correspondent, simple as it is, or rather on account of its very simplicity, is well worthy of attention. It is not necessary to insist on the necessity of some kind of signals to avoid collisions, and the constantly recurring record of such accidents in our newspapers shows pretty conclusively that those at present in use are insufficient. In fact, nothing but absolute necessity could justify the apparent absurdity of having recourse to sight-signals to avoid accidents arising from the want of power to see. But the circumstances which deprive us of the use of our eyes, exert no power over our ears; and it is very easy to arrange signals by sound which may tell all that we want to know. The direction of the sound can be made out with sufficient ease and accuracy to prevent running into its origin; and the properties of sound, the differences in tone, in duration, and in loudness (even those of quality might, if necessary, be used), will give us a very large number of signals capable of being heard at great distances, and of being distinguished by the dullest apprehensions. The two signals suggested by our correspondent, for instance, consisting of a low short sound, followed by a high and long one, and the reverse, are sufficient to indicate the direction in which a vessel is

heading—and as the direction in which she lies at the moment is known, these are all that are in most cases wanted.

If any one doubt the feasibility of such uses, let him take one of the small steamers that run along the coast of Maine, between the islands and the main—a coast infested in the summer by almost continued fog—and see how rapidly and accurately the position of land or vessels is determined by the echo of the steam whistle; and we do not doubt that he will come back convinced of the possibility and utility of such signals. ED.

For the Journal of the Franklin Institute.

Particulars of the Steamboat John Brooks.

Hull built by John Englis. Machinery by Allaire Works, New York. Intended service, New York to Bridgeport, Connecticut.

HULL.—			
Length on deck, from fore part of stem to after part of stern post, above the spar deck,		250 feet.	
Breadth of beam at midship section,		34 "	
Floor timbers—molded, 14 inches—sided, 11 inches.			
Frames—apart at centres, 26 inches.			
Depth of hold,		11 "	
" to spar deck,		11 "	
Draft of water at load line,		7 "	
" below pressure and revolutions,		7 "	
Tonnage,	900.		
ENGINE.—One—Vertical beam.			
Diameter of cylinder,			56 inches.
Length of stroke,		12 feet.	
Maximum pressure of steam in pounds,	40.		
Cut-off,		8 "	
Maximum revolutions per minute,	22.		
BOILERS.—Two—Return flues.			
Length of boilers,		26 feet.	
Breadth "		10 "	6 inches.
Number of furnaces,	3 in each.		
Breadth "		43 × 36 inches.	
Length of grate bars,		7 feet.	
Number of flues,	24.		
Internal diameter of flues,		21, 14 and 13 "	
Diameter of smoke pipe,		4 feet 6 "	
Height "		40 "	
Description of coal,	Anthracite.		
PADDLE WHEELS.—			
Diameter,		34 feet.	
Depth of blades,			22 inches.
Number "	28.		

Bronze of Aluminium.—Letter of M. Christofle to M. Dumas.

We have applied the aluminium-bronze to two uses for which its qualities of hardness and tenacity appear usefully applicable, and success has answered our attempt. The first is the manufacture in this

bronze of axle-bearings, and rubbing surfaces for machines. We give as examples:—

First, An axle-box which was placed on a polishing lathe making 2200 turns per minute; it lasted for nearly eighteen months; other boxes in the same condition do not last over three months.

Second, A carriage for a circular saw, making 240 turns per minute, which has lasted for a year without an apparent trace of wear; the carriages in common bronze do not last more than four months.

The second application is the employment of this bronze in the manufacture of guns of all kinds. We made a pistol-barrel, which, after having been tried at Paris, was afterwards at the Exhibition at Dijon. It underwent the tests in presence of the jury, and answered perfectly our expectations. We are aware that these experiments cannot be conclusive as to its application for artillery; but the comparative experiments which we have made with this metal, bronze, iron, and steel, have shown the immense superiority over those different metals.

The bars may be worked hot as easily as the best quality of steel.—*Academy of Sciences of Paris.*

(The bronze here spoken of, is formed of 90 or 95 parts of copper, and 10 or 15 parts of aluminium. ED. JOURN. F. I.)

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*Destructive Effects of Red Lead upon Iron.**

Mr. Robert Lamont, who was, a few months back, requested by the managers of one of the largest steam packet companies in the kingdom to make a report on the merits of certain compositions used to a large extent in Liverpool for the preservation of iron ships, and to prevent fouling on the bottoms of such vessels, has come to the conclusion, so far as regards the use of red lead, or paints containing lead, quite at variance with the popular notion upon the subject, by declaring the use of that pigment for coating iron vessels to be most pernicious. And in this hypothesis he is confirmed by the opinion of Mr. Nathan Mercer, F. C. S., who, after inspecting the iron ship *William Fairburn*, the plates of which were coated with red lead prior to her late voyage to Calcutta, observes that the extent to which the iron had been corroded could not fail to have attracted the attention of the most superficial observer. On a close inspection he found the red lead coating covered with blisters, from each of which, on being opened, a clear fluid escaped, and left exposed on the surface of the iron a number of brilliantly shining crystals of metallic lead. Mr. Mercer says each blister is, in fact, a galvanic battery in miniature, and that, as wherever there is electrical there must be also chemical action, the corrosion is easily accounted for. This action, he says, will continue as long as any red lead remains, and is necessarily at the expense of the iron. He also points out that the "sweat," so well known to every person interested in iron ships, is not, as is generally supposed, salt water, but a solution of chloride of iron manufactured in the blisters. Mr. Mercer considers this sweating is due, in a great degree, to the

* From Herapath's Journal, No. 1037.

use of red lead paint in immediate contact with iron; and he recommends, therefore, that it should never be used as a coating for sea-going vessels, unless special precautions are taken to prevent its coming into direct contact with the iron.—*Liverpool Albion.*

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*Water Boiled without Fuel.**

It had always been considered that water presented an exception to the rule observed to hold in other bodies—namely, that their temperature could be raised by friction or percussion, until Mr. Joule showed that water manifested a sensible rise of temperature by a brisk agitation continued for some time. His range of temperature did not, however, we believe, exceed 2° Fahr. George Rennie, F.R.S., so well known in the engineering and scientific world by a pamphlet before us, has so improved on the experiments of Mr. Joule and others, as to have succeeded in raising the temperature of water by churning up to the boiling point 212° Fahr.

* From Herapth's Journal, No. 1022.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, June 16, 1859.

John C. Cresson, President, in the chair.

John F. Frazer, Treasurer, } Present.
Isaac B. Garrigues, Recording Secretary, }

The minutes of the last meeting were read and approved.

Letters were read from the Superintendent of the Geological Survey of India, and the Geological Museum, Calcutta, India; the Regents of the University of the State of New York, Albany, N. Y.; the Union College, Schenectady, New York; the Massachusetts Charitable Mechanics' Association, Boston, Mass., and the University of Michigan, Ann Arbor, Michigan.

Donations to the Library were received from the Royal Society, and the Chemical Society, London; the Government of India, Calcutta, India; the Austrian Engineers' Association, Vienna, Austria; L. A. Huguet-Latour, Esq., Montreal, Canada; the State University of Michigan, Ann Arbor, Michigan; the Proprietors of Locks and Canals on the Merrimac River, Lowell, Massachusetts; the Chamber of Commerce of New York; B. H. Latrobe, Esq., and the Board of Commissioners of Public Schools, Baltimore, Maryland; the New Orleans School of Medicine, New Orleans, Louisiana; the American Philosophical Society, and Professors John F. Frazer and John C. Cresson, Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement of the receipts and payments for the month of May.

The Board of Managers and Standing Committees reported their minutes.

Candidates for membership in the Institute (7) were proposed, and the candidates (6) proposed at the last meeting were duly elected.

A. Stone & Co., sent to the meeting for the inspection of the members a sample of the air-tight jars made by them, intended for the purpose of preserving fresh fruits. The jar is of glass, with a wide mouth, in which two projections are made at points opposite each other. The cover is also of glass, and is made with a screw upon the part that goes into the mouth; two openings are cut across the screw, so that the cover may be inserted in its position. On the cover, which extends beyond the mouth, are two projections for the purpose of turning the cover so that the screw will catch under the projections in the mouth, and draw the cover down tightly upon the edges of the mouth. To insure an air-tight joint, a ring of gum is placed under the cover before it is screwed down.

Mr. Eddy, artist, of this city, presented a beautiful specimen of his work in a cabinet size picture, of a lady. The impression was first taken by the crystalotype process, and that painted in with oil colors, thus making a picture possessing all the truthfulness of the daguerreotype, with the animation, durability, and softness of oil coloring. While possessing these additional advantages, so much less time is occupied than when the drawing is done by hand, that the pictures can be made at about one-fourth the usual cost of oil painting.

The rendering wheels used upon the planes of the Mine Hill Railroad, were shown in a model laid upon the table. The wire rope, used for hauling up the cars upon this road, winds upon these wheels, and bears upon wood set endwise, so that the ends of the grain are presented to its pressure. The wood is of oak, hickory, or such wood as will not wear rapidly or crush easily, but permit a sufficient indentation of the strands to prevent slipping. The wood is held between a flanch cast on one side of the face of the wheel, and a detached ring forming a flanch on the other side, and held up with bolts. By this arrangement, a piece of defective wood can be easily removed, and its place supplied with another. The wheels have been at work for some months, and are giving satisfaction by their performance.

COMMITTEE ON SCIENCE AND THE ARTS.

Report on an Improved Protractor, invented by Charles Gordon.

The Committee on Science and the Arts constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination "an Improved Protractor," invented by Charles Gordon, of Washington City, D. C.,

Report:—That this protractor consists of a parallel ruler of the usual form, having attached to it a semicircle graduated to any desired division of the circle. This ruler is attached to a bar by a set-screw passing through the centre of the semicircle, so that the ruler can be clamped at any angle to the bar. A vernier and a reading glass facilitate this adjustment. The bar to which the ruler is attached forms part of a heavy plate of metal which is made in the form of a triangle,

having two of its sides at right angles to each other. The weight of the plate keeps the instrument in its place upon the paper, and by setting either of its sides to coincide with any given line upon the paper, any lines may be drawn making given angles with the first or meridian line.

It is especially intended for plotting from the field notes of a compass survey, and is, for that purpose, admirably adapted, since short lines making known angles with each other or with a meridian can be very accurately and quickly laid down. The difficulty of placing the centre of the protractor exactly over the point at which the angle is laid off, which is common to all existing forms, is not present in this arrangement, where the divided semicircle turns about a mechanical axis, and not an imaginary one.

The Committee recommend the instrument as very simple, and as exceedingly useful for facilitating many varieties of a draughtsman's work.

By order of the Committee,

Philadelphia, January 9, 1859. WM. HAMILTON, *Actuary.*

BIBLIOGRAPHICAL NOTICES.

Geological Survey of Canada. Sir W. E. LOGAN, F. R. S., Director. Figures and Descriptions of Canadian Organic Remains. Decade III. Montreal, 1858. 2000 copies issued, of which 500 are reserved for the Legislature, and the remainder sold at a moderate price.

This pamphlet of 100 pages with eleven plates, consists of First, a Preface by Sir W. E. Logan, Director of the Geological Survey of Canada; 2d, a Memoir on the Cystideæ of the Lower Silurian Rocks of Canada, by E. Billings, Esq., F. G. S.; 3d, a Memoir on the Asteriadæ of the Lower Silurian Rocks of Canada, by the same; 4th, a Memoir on Cyclocystoides, a new genus of Echinodermata from the Lower and Middle Silurian Rocks, By J. W. Salter, Esq., F. G. S., of the Geological Survey of Great Britain, and E. Billings, Esq.; 5th, a Memoir on the Palæozoic Bivalve Entomostraca of Canada, By T. R. Jones, Esq., F. G. S.

Although called Decade III, this is the first published of a series of reports intended to illustrate the Palæontology of Canada and the northern border of the United States; new ground, and full of new and unexpected forms of ancient life; to the study of which, Mr. Billings brings an ardent zeal, a clear eye, nice analytical judgment, indefatigable diligence, and a lucid and agreeable style. He has, on this side of the water, the advantage of the friendship and co-operation of James Hall, whose collection and whose judgment are unsurpassed; and he has spent a sufficient time previous to the printing of this Decade, in England, in comparing his specimens with those in the collections of the Geological Survey of Great Britain, and his views with those of Salter, Ramsey, Murchison, Barrande, and other palæontologists of

Europe. We therefore hail the appearance of this beautiful little volume as the forerunner of an invaluable series.

Mr. Billings was appointed Palæontologist of the Canada Survey in 1856, and his first work was to arrange the museum at Montreal. It was in order and gave the liveliest satisfaction to the members of the American Association who had an opportunity of examining it at the Montreal meeting in 1857. Lofty cases round the rooms exhibit the larger specimens, and glass-covered tables occupying the central spaces cover piles of drawers, full of the treasures which we expect to see portrayed and described in these decades. Into the walls of the landing places in the staircase hall are set numerous huge slabs of sandstone on which are seen rows of foot tracks, upon ripple-marked surfaces, pitted with the marks of rain drops, scratched in compound lines by small crustaceans, or trailed over by aboriginal worms. Into this museum have been thrown for the last two years the very numerous contributions from the extreme east of Canada, Anticosta, and Newfoundland; and among them, a unique collection of those wonderful creatures, the Silurian Graptolites, to be described by Hall.

We are glad to learn from the preface of the Decade, that twenty-four species of these and allied genera from the Hudson river group, drawn by Meek, and engraved on steel by Gavit, will be given by Hall in Decade II, commenced in 1855. A preliminary description of these was published in the Report of Progress in 1857. Decade I was confided in 1855 to Salter, the well-known English palæontologist, and must by this time be in the printer's hand. Its plates are by Sowerby from drawings by Bone; and its object is to exhibit the commingling at one locality of forms heretofore supposed to belong to distinct epochs. We admire this fresh example of the fearlessness of true science. Palæontologists are disposed to slight the argument from lithological constitution and mineral sequence for identifying rocks over wide intervals, and to put their whole trust in the outspread and sequence of animal forms. Structural geologists, on the other hand, are too tenacious of mere color and composition as sufficient clues to lead inquirers through the maze of broken ground. Every discovery of a fossil genus or species fixed at one horizon, and not discoverable above or underneath it, is a blow given to structural bigotry; and conversely, every discovery such as the one described above, to be presented in the first Decade of the Canada Survey, of a mixing up of earlier and later forms in the same bed, or in a known cotemporaneous deposit, is a still harder blow given to the still more mischievous bigotry of the mere palæontologist. But when a man is found, who is both a structural and a fossil geologist like James Hall or Sir William Logan, science is allowed to speak for herself, and then she harmonizes all.

The Decade before us gives us beautiful and copious delineations of a class of extinct forms which has of late excited a new interest. In the order of forms, the cystideans come between the fixed stone-lilies, encrinites, &c., and the floating trilobites; some are flat and some are round, globular or ovoid, and even cylindrical, but they all remind the spectator at once of the trilobite, and of the encrinite. Their lowest

forms had a hard tesselated back on one side, and a flexible and also tesselated, or we may almost call it, shagreened calcareous belly on the other side; and they were supported on a sort of tapering stem tail, composed like the foot-stalk of the stone-lilies, of numerous joints. At the apex waved two tapering jointed horns or arms, and certain small holes or slits, noticeable between the horns, or notched into the edges of the back plates, are considered by Mr. Billings to have been both mouth and anus. Some of these lower forms resemble the head of a viper, especially on the under side. As we ascend in the scale, the cystid becomes very beautiful, sculptured with radiating ridges and mathematical figures, and crocketed like a gothic pinnacle along the edges. This effect is produced by the falling of the arms down against the body. Some of the species have no arms at all as seen in the fossil condition, but are grooved from the summit downward, showing where their flexible, soft, and perhaps gelatinous arms originally lay. Some of these *Glyptocystites* are models for a designer. Still higher in the scale we find globular cystidæ, pitted like strawberries, (*comarocystites*,) or elongated like almonds, (*amygdalocystides*,) and adorned with arms which are themselves armed so that these creatures appear to have waved flexible stony plumes before them. The pits are sunk like the rosette panels in the vault surface of St. Peter's, and are exquisitely sculptured. In the apple-formed *malocystites* these plumed arms fall against and ramify over the globe, covering it with a charming net work.

For the internal structure of these curious beings, and the way they reproduced their young, along their arms like starfish, or in the manner of ferns in the vegetable kingdom, we must refer the reader to the text of Mr. Billings.

That the cystidean idea passes up into that of the starfish, is evident at a glance at the plates which illustrate Mr. Billings' paper on the Asteriadæ. Plate VIII shows us globular forms of tesselated stony matter with five arms tightly bound down upon the surface; arms which bear a perfect general likeness to those of a starfish of the present day. Plate IX shows the whole globe absorbed into the five arms, and Plate X gives still further developed forms of the most elegant character, in which the arms exist alone like expanded flowers. Plate XI exhibits the last and strangest metamorphosis of all, in which the arms sink back upon a disc like a half dollar, with tracery radiating from the centre to the ornamented edge, and bifurcating again and again like a brilliant design for a cathedral rose window. We recommend to Hunt or Notman the figure 5* b Plate X for the next great rose window they require.

Murchison in his last edition of the Siluria, London, 1859, gives on page 245, a number of small cuts of the cystideæ of the Wenlock limestone, (Upper Silurian,) one of which, *Pseudocrinites magnificus*, might have been called quite as appropriately *horridus* or *caput medusæ*, for it is entirely surrounded by waving matted stony locks of arms.

The subject leads us directly into that world of late investigation, the Crinoideæ, of which the two volumes of the Iowa Survey just pub-

lished by Hall, and the third volume of the Kentucky Survey published last year by Owen, furnish the freshest illustrations. We will speak of these hereafter. L.

The Chemistry and Metallurgy of Copper, including a description of the principal Copper Mines of the United States, &c., &c. By A. Snowden Piggot, M. D., Philadelphia : Lindsay & Blakiston, 1858.

This duodecimo of 388 pages is one of those complete little manuals which the practical genius of modern science has been furnishing of late years to the mere working world, and the value of which cannot be estimated except by the necessities of those who find themselves involuntarily consulting them upon all occasions. A few paragraphs and a few wood-cuts on this or on that question, to elucidate this or that difficulty, are very little to the reading or even to the thinking world, but are everything to the student, who blesses every stray ray of light, and to the workman wondering where the man lives who was ever troubled as he is, or who can show him the way out of his perplexities. If the present age differs from preceding ages in any trait of its life form, this may be stated as its characteristic difference, that it sums up, states curtly, and illustrates clearly, the practical scientific materials, provided by the past and perfected by the present, for every employment of man, in its hand-books for every country, science, and art. The book before us has seven chapters: the first devoted to the chemical relations of copper, the second to the ores, the third to their analysis, the fourth to mines and mining in general, the fifth to copper mines in particular, the sixth to copper smelting, and the seventh to the alloys of copper used or useful in the arts. The chemical compounds of the metal are given, therefore, in two forms, first as they are produced or reduced in the laboratory, and then as they appear in the great laboratory of the earth-crust in three of the four classes of copper ores, native copper constituting a first class by itself. The other three classes are the oxides and chlorides, the compounds with sulphur, selenium, arsenic, and antimony, and the numerous and heterogeneous compounds of copper with the remaining elements. It is curious to see how almost exactly sulphur and oxygen replace each other in their alliance with copper; normal copper glance being 79·8 Cu + 20·2 S, and 79·86 Cu + 20·13 O being normal black oxide. In a geological point of view, the most important ore of copper is the pyrites or double sulphuret of iron and copper, 34·47 Cu + 30·48 Fe + 35·05 S = $Cu_2\,S + Fe_2\,S_3$. This mixed with the red oxide forms the ore described on page 275.

The analysis and assay of copper ore are fully treated in 52 pages. Chapter third contains 50 pages on general mining, in which the author states and illustrates his views of the formation of mineral veins, and evidently leans to the theory of *lateral secretion.* The fourth chapter describes the geographical distribution of copper ores ; first, in the old world and South America, and then more elaborately in the Lake Superior region, the Mississippi Valley region, and the region of the

Atlantic States, after the arrangement of Whitney. Twenty pages are devoted to these three regions. The table on page 241, brings the yield of the East Cliff mines down to 1855, and the dividends of the Company to 1856. The table on 249 brings down the yield of the Minnesota also to 1855, and we notice that this is about the limit of statistical information, as to time, in this section. Every mine opened at that date is mentioned and described more or less in detail. The Silurian ores of Wisconsin and Missouri deserve and receive but a slight mention. Dr. Piggot then begins at Maine, and descends the Atlantic seaboard to Georgia, noticing chiefly the copper lodes of Virginia and Eastern Tennessee, and ending with the copper mines of the New Red Sandstone of New Jersey and Pennsylvania. In some cases the statistics come forward to 1857, and important modifications of the first opinions formed of some of these exhibitions of copper are shown by subsequent experimental work to be necessary. We point to the Manasses gap mine as a warning, how needful a proper examination and method of attacking a vein is, to justify proceedings upon even the best chemical analysis of hand specimens. Veins lately discovered in the same neighborhood, and with even a finer show of copper than the Manasses gap outcrop made, will lead to the same results unless due care be taken to insure preliminary knowledge of the ground.

The fifth chapter on smelting copper, gives in great detail (from Muspratt) the English process pursued at Swansea, with cuts of furnaces and descriptions of the ten successive operations. Then the patent processes of Napier, Brankart, Rivot & Phillips, Davies, Birkmyre, De Sussex, Low, &c., with the objections to them; the French method pursued at Chessy, near Lyons; and finally, the smelting of the Mansfield copper schists in Germany, with pictures of the apparatus.

The last chapter on the practical alloys, and the Appendix of tables of statistics, are of considerable interest to the general reader, and advance the statistics of the production of Cornwall to 1857. L.

The Iron Manufacturer's Guide to the Furnaces, Forges, and Rolling Mills of the United States, with discussions of Iron as a Chemical element, an American ore, and a manufactured article, in Commerce and in History. By J. P. LESLEY, Secretary of the American Iron Association, and published by the authority of the same, with maps and plates. New York: John Wiley. London: Milner & Co., 1859. 8vo., pp. 772.

As indicated by its title, and more fully in its preface, this work is intended as a manual of important information to every one concerned in the manufacture or use of iron. It divides itself naturally into two parts. First, a directory intended to give the location and general statistics of all iron works in the United States and Canada, classified as furnaces, forges, and rolling mills. This portion, which has required great labor and perseverance in acquiring the information thus communicated, occupies 262 pages, and is illustrated by four maps;

two of which are very good specimens of the new process of photography as applied to lithography. This valuable mass of information for every one in any way concerned in the use of iron, is due to the enterprise of the American Iron Association, a company which has done much valuable service to the arts and industry of our country, and deserves the encouragement of every American. The second part of the book consists of a practical treatise upon iron, and its ores. The treatise on iron as a chemical element will be found to be a very carefully elaborated digest of almost every thing of value which has been written upon iron, since its great importance has been recognised. The account of the ores is divided into chapters on the primary ores, the brown hæmatite, the fossil ore, the carbonates, and the bog ore; and under each head are given the principal localities, the mode in which the ore lies, and its gangues; the theory of its occurrence, the modes of working it, and the results of these various methods so far as they can be reached. This portion will be found of great interest not only to the practical iron worker, but to every one who takes an interest in the natural history of our country, and especially to the geologist and mineralogist.

The third and fourth divisions have been pressed out by want of space, and will form the subject of a subsequent publication. They include the discussion of iron as an American manufacture, and in American history. Some twenty pages are, however, occupied with the statistics of the manufacture as collected by the Association, and the results are, as far as possible, digested in tables which give much valuable information upon this, the most important branch of our manufactures.

It is not our intention now to discuss the peculiar theories of Mr. Lesley, or of the authors whom he quotes with approbation—but to express our high approbation of the intelligence, zeal, and perseverance which are indicated in the preparation of this work, and to recommend it, and the subjects of which it treats, and the Association under whose auspices it is published, to the familiar attention of our readers. ED.

Conservatory Journal; devoted to establishing a Massachusetts Conservatory of Arts, Science, and Historical Relics.

The gentlemen of Boston who feel an interest in the education and elevation of the people, have determined to establish in their city an institution similar to the Zoological Garden of London, and the Jardin des Plantes of Paris. The newspaper whose title we give above, is devoted to the furtherance of this object, and undoubtedly in a city so famous for the liberality and public spirit of its citizens, their efforts will be successful. Such a project has been smouldering in our city for years, but is not likely ever to rise above an *eremacausis*. We hope our neighbors will show us the way, and compel us to follow.

F.

Abstract of Meteorological Observations for April, 1859; made in Philadelphia, Somerset, Dauphin, and Centre Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

Philadelphia.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. Kirkpatrick, Observer.

1859. April.	Barometer. Mean.	Barometer. Mean daily range.	Thermometer. Mean.	Thermometer. Daily oscillation.	Thermometer. Mean daily range.	Relative humidity. 2 P. M.	Force of vapor. 2 P. M.	Rain and Snow.	Prevail'g winds.
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	Direc.
1	30·010	·214	50·7	23	3·2	24	·126		(var.)
2	29·878	·132	51·3	20	4·7	36	·201	} 0·294	(var.)
● 3	29·457	·421	57·7	18	6·5	83	·478		(var.)
4	29·547	·096	48·0	14	9·7	22	·096		W.
5	29·624	·077	40·8	11	7·2	40	·124		W N W
6	29·731	·107	42·3	19	4·5	24	·085		W N W
7	29·757	·060	47·5	20	5·2	26	·109		S W.
8	29·800	·092	41·3	6	10·5	81	·194	0·100	N W.
9	30·068	·268	42·0	18	8·0	30	·102		N W.
☽ 10	29·971	·097	43 8	8	3·5	54	·169		N E.
11	29·587	·400	45·0	8	2·8	85	·297	0·949	(var.)
12	29·754	·167	49·2	15	6·7	74	·308		(var.)
13	29·781	·027	54·7	15	5·5	71	·382		S W.
14	29 639	·142	45·0	7	9·7	92	·265	0·996	E.
15	29·572	·067	50·3	23	10·0	40	·215		S W.
16	29·565	·110	47·7	11	8·7	32	·116		W.
○ 17	29·714	·149	46·5	15	4·8	41	·159		W.
18	29·800	·086	49·2	14	2·7	29	·130		N W.
19	29 745	·095	51·0	15	1·8	42	·202		W.
20	29·724	·039	53·3	16	2·3	28	·139		W.
21	29·649	·074	57 3	17	4·0	48	·300	0·213	S W.
22	29·483	·166	49·8	6	7·5	79	·301	1·775	S E.
23	28·999	·484	44·7	7	5·2	55	·178	0·096	(var.)
☾ 24	29·614	·615	50·7	22	8·0	28	·139		W.
25	29·743	·136	61·3	25	10·7	40	·292		S W.
26	29·683	·061	63·3	19	3·3	50	·389	0·065	S S W.
27	29·683	·073	54·2	4	10·5	86	·348	0·180	N N E.
28	29·890	·207	48·5	11	6·7	33	·143		N E.
29	29·829	·081	56·6	25	7·3	24	·147		(var.)
30	29·744	·085	64·7	33	8·3	22	·214		N N E.
Means	29·701	·160	50·3	$15\frac{1}{2}$	6·3	47	·212	5·668	N 68 $\frac{1}{2}$ W

Somerset, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. Geo. Mowry, Observer.

1859. April.	Bar. Mean.	Ther. Mean.	Relative humidity. 2 P. M.	Force of vapor. 2 P. M.	Rain and Snow.	Prevail'g winds
	Inch.	°	Per ct.	Inch.	Inch.	Direc.
1	27·807	41·3	52	·242		W.
2	27·552	47·7	59	·249	0·084	S E.
3	27·272	53·7	48	·241		W.
4	27·348	35·0	51	·142		W.
5	27·346	28·7	77	·134	0·069	W.
6	27·551	35·0	54	·149		W.
7	27·518	43·7	52	·212		W.
8	27·614	34·3	83	·221	0·240	W.
9	27·808	33·7	60	·172		S E.
10	27 556	39·3	91	·234	0·656	S S E.
11	27·256	59·7	65	·502	0·140	(var.)
12	27·538	61·3	54	·442	0·068	W.
13	27·567	60·7	82	·570	0·057	W S W.
14	27·307	57·7	75	·529		S S E.
15	27·250	49·7	49	·255		S W.
16	27·380	36·3	72	·173	0·085	W.
17	27·499	34·3	74	·199	0·121	W N W
18	27·642	39·7	66	·257		W N W
19	27·589	43·0	61	·255		W.
20	27·539	39·3	86	·210	0·273	S E.
21	27·398	55·3	56	·397		W.
22	27·197	48·3	89	·328	} 0·890	(var.)
23	26·973	34·3	90	·199	1·588	W N W
24	27·468	40·7	57	·199		W.
25	27·532	56·7	56	·397		S W.
26	27 500	53·3	93	·390	0·252	S W.
27	27·458	50·0	96	·368	1·016	(var.)
28	27·669	46·7	87	·362		(var.)
29	27·656	51·0	48	·300		E.
30	27·620	55·3	52	·366		E.
Means	27·483	45·7	68	·290	5·539	

Harrisburg, Dauphin Co. 40° 16′, N. 76° 15′, W. John Heisely, M D., Obs.

1859. April.	Bar. Mean.	Ther. Mean	Rain and Snow.	Prevail'g winds.
	Inch.	°	Inch.	Direc.
1	29 947	51·7		N W.
2	29·746	52·3		S E.
3	29·325	54·3	{ 0·067	(var.)
4	29·456	46·7		N W.
5	29·552	39·7		N W.
6	29·676	43·3		N W.
7	29·620	50·3		W.
8	29 748	43·3		N W.
9	30·019	43·0		N W.
10	29·835	42·7		S E.
11	29·461	46·7		E.
12	29·657	54·3	1·371	S.
13	29·679	62·0		S.
14	29·498	50·7	1·410	E.
15	29·403	51·7		S.
16	29·503	46·0		N W.
17	29·625	47·3		N W.
18	29·763	48·7		N W.
19	29·720	48·3		W.
20	29·664	52·0		(var.)
21	29·536	57·3		(var.)
22	29·364	52·0		S E.
23	28·869	44·7	2·012	N.
24	29·530	50·0		N W.
25	29·659	57·3		(var.)
26	29·582	61·0		S.
27	29·596	55·0	0·674	N E.
28	29·837	53·0		(var.)
29	29·788	58·0		(var.)
30	29·681	65·3		S.
Means	29·611	50·9	5·534	

Fleming, Centre Co. Lat. 40° 55′ N. 77° 53′ W. Ht. 780 ft. S. Brugger, Obs.

1859. April.	Ther. Mean.	Rain and Snow.	Prevailing Winds.
	Inch.	Inch.	Direc.
1	45·0		N W.
2	48·0		S E.
3	54·3	0·200	(var.)
4	37·0		(var.)
5	32·7		N W.
6	36·0		N W.
7	44·0		(var.)
8	37·0		N W.
9	41·3		(var.)
10	40·0	0·920	S E.
11	49·3	0·190	(var.)
12	57·0		N W.
13	61·3		S E.
14	51 0	0·550	(var.)
15	50·7		(var.)
16	30·3		N W.
17	42·3	0·030	(var.)
18	39·7		(var.)
19	46·0		N W.
20	49·7		(var.)
21	55·3		N W.
22	51·0	1·500	S E.
23	37·0	0·980	N W.
24	44·3		N W.
25	56·3		S W.
26	57·0	0·630	W.
27	48·0	0·200	E.
28	48·3		E.
29	54·0		(var.)
30	59·0		S E.
Means	47·0	5·200	

JOURNAL

OF

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OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

AUGUST, 1859.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Steam and its Condensation. By Thomas Prosser, C. E.

(Continued from Vol. xxxvii. page 365.)

CHAPTER VIII.

Comparative Results of Experiments made April 28th and May 3d, 1859, with other Experiments and Remarks thereon.

This Chapter is devoted to *Results* and their concomitants. And,

First. To the actual cost (in *coal*) of production of *steam* from water at 100° C. The grate and recipient heating surfaces, and the relative *weights* of coal employed.

Secondly. To the surface required for its condensation.

Thirdly. To its *abstract practical value*, irrespective of the means employed to make it available as a motor. If no one dreams of holding the *minter* responsible for the misuse of his manual coinage, why should another *minter* be held responsible for the misuse of his mental coinage? Enough for me to produce the steam and condense it economically, leaving to the mechanical engineer the responsibility of its application.

Steam has a fixed mercantile value, even as gold has, but it is far more liable to abuse; for all know the value of the latter, but few know any thing about the former as an article of merchandize.

Hence, I take no account (except incidentally) of the mere fact, that the *steam* in these experiments was actually used in a steam engine in the usual manner; but I must not omit the fact, that after having been so used, it entered the condensing apparatus perfectly dry, showing beyond all doubt, not only that there had been no priming, that no vesicular water had gone over with the steam; but also,

that there had been no condensation in the cylinder. When this has been done, all has been accomplished, which, in an economical point of view, superheating the steam admits of, although the advocates of the separate superheating ignore the fact, excepting the late Dr. Haycraft, who formerly belonged to that ultramontane party, but whose imitators do not appear to have attained one rational idea on the subject.

I shall institute, a comparison with my own, of the *evaporative effects* of two other boilers made and manned for the purpose, and shall show as conclusively as the case admits of, that no such immunity from priming, or going over of vesicular water with the steam, can be claimed for them, and therefore in comparing those boilers with mine, after making due allowance for the additional *total* heat in my steam as well as for its superheat, both of which operate equally in preventing condensation in the cylinder, my boiler is still compared with them at an unknown disadvantage, because it is impossible to divine how much *unconverted* water went over with their steam.

The proof offered is universal experience, which confesses that all ordinary boilers prime more or less, or carry over vesicular water with the steam. This point is too important to be passed over without further inquiry. Watt never knew what became of much more than half of the water which his boiler got rid of, at least he could only account for about that quantity as *steam*. The boilers of H. B. M. Steamer, the "*Bee*," took 1080 lbs. of water from a tank, but only 580 lbs.* were ever accounted for per indicator. The Manchester engineers, too, with the same system, have recently got out of their boilers 12·25 lbs. of water for 1 pound of coal consumed. But the Admiralty engineers who were sent to examine into the matter, although they were "*witnesses*" who saw sights of 11·05, 10·97, and even 12·44 lbs.† of water evaporated by 1 pound of coal, cruelly close their Report by observing that they "had some doubts as to the dependence that might be placed on the feed apparatus for the boiler, with reference to the exact quantity actually entering the boiler as measured to the feed apparatus and registered by the meter. Priming of the boilers was evidenced in an especial manner on the first and second day's experiments; it was not constant, but intermittent. Owing to these circumstances, we cannot place so much dependence on the accuracy of the results of the experiments as could be wished." ‡

A very mild way, indeed, of intimating that the experiments were really of no value whatever, because the *palm* for evaporation must necessarily be given to the boiler which primed most.

What, then, are we to say to the reported evaporation of 15 pounds of water with one pound of coal? Not, certainly, that it is impossible; but it may just as well be made 20 or even 30 by *improving* the priming of the boiler; not that any of the ordinary multitubular ones are deficient in that *qualification*, by no means, but it is desirable to know how far it may be carried with a *pensive* public, so that we may as-

* The Indicator and Dynamometer by Main & Brown, page 31.
† Civil Engineer and Architect's Journal, April, 1859, page 122.
‡ See Mr. Isherwood's remarks. Also Journal Franklin Institute, Vol. xxviii, (3d Series,) page 262.

certain, not merely which feather broke the (humbug) camel's back, but the wretch who put it there. One would think, that a locomotive of *five hundred horse power** would do the job; but no, it won't, that has been tried and failed—make it camels then!!!

Is it not singular, that, of all the experiments made on the evaporation of water, there is not one recorded which shows, that any precaution had been taken against the water escaping, *unconverted*, with the steam? Few, indeed, take the trouble of recording any thing but the mere results, and for this you have only their *bare* word, which, in this matter-of-fact-age, is not of much account.

1st Report, 1844.

In the elaborate Report on the "*evaporative power*" of coals, made by Prof. W. R. Johnson, in 1844, by order of the Secretary of the U. S. Navy, the boiler employed was 30 feet long and 42 inches diameter, set in brick-work, with a furnace underneath it at one end, so as to expose 130 feet superficial to the action of the fire. Two 10-inch return flues containing 157 feet superficial within the boiler, brought back the products of combustion to the front over the furnace, from whence they escaped into the chimney stack, having been exposed to 287 feet superficial, of heating surface. But, by causing the gases again to traverse twice the length of the boiler, 90·5 ft. superficial more surface was obtainable, making 377·5 ft. superficial.

The grate had an area of 16·25 ft. $=(5 \times 3{\cdot}25\text{ft.})$ being as 1 to 17·66, and 1 to 23·23 of the recipient heating surface, according as to whether the one or the other of the above described methods was adopted. The grate also admitted of a reduction so as to make the proportion as 1 to 33·18 and 1 to 36·68 respectively. The grate bars were $\frac{3}{4}$-inch thick and $\frac{1}{2}$-inch apart. The consumption of fuel per foot of grate surface did not exceed 8 pounds per hour, and the pressure of the steam was less than 7 pounds per square inch above the atmosphere.

The highest evaporative effect with one pound of coal was 10·7 lbs. of water from 212° F., the whole steam from which was thrown into the chimney, as well as the products of combustion from a small furnace, to improve the draft.

2d Report, 1848.

In the no less elaborate experiments on the "Coals suited to the Steam Marine," by Sir Henry de la Beeche and Dr. Lyon Playfair, in 1848, by order of the British Admiralty, the highest evaporative effect from one pound of coal was 10·75 of water from 212° F., but the steam was allowed to escape without note or comment into the open air.

The boiler employed was set in brick-work. It was 12 feet long and 48 inches in diameter, with an internal flue 30 inches in diameter, at one end of which the furnace was placed; from thence the products of combustion passed to the other end, and returned alongside the boiler on the outside thereof to the front again, where they descended and passed under the bottom of the boiler to the chimney, after having operated upon 197·5 ft. superficial of recipient heating surface.

* Got up on the supposition that the steam pressure in the cylinder is the same as that in the boiler, and ignoring the "blast," and back pressure which it causes on the piston.

The grate was 2·5 ft. × 2 ft., giving an area of 5 ft. The grate bars were ¾-inch thick and ½-inch apart. The grate surface was therefore as 1 to 39·5 feet of the recipient heating surface in the boiler.

The evaporation was about 80 lbs. of water to 1 foot of grate surface, which does not differ materially from the American experiments.

3d, My Boiler, 1859.

Now, my boiler differs in every conceivable respect from the two before described, for it has no grate properly so-called, but a hollow water-slab pierced with holes and short tubes expanded therein. The furnace is 17 inches square, and consequently has an area of 2 feet, on each foot of which, 16 lbs. of coal per hour was consumed, being about double the amount consumed on those before referred to, while the recipient water-heating surface is 100 feet superficial, with an additional 50 feet of steam superheating surface. This large superheating surface adds but little to the elasticity of the *steam*, but greatly to its safety, for inasmuch as the great immobility of steam, as well as of other gases, prevent rapid absorption of heat by them, a large surface is required, because limited to a low temperature on account of the danger attendant upon the reverse in the rapid corrosion of the boiler.

My boiler is of the upright multitubular kind, with tubular water leg furnace, hollow slab, and annular generator.

The condensing apparatus is of the slabannular kind, as shown by the colored plate attached to Chapter I, and with the boiler, has been examined by a Board of Engineers appointed by the Secretary of the United States Navy. The same Board have, as I understand, many reports to make on boilers and surface condensers* besides mine, which may thus cause some delay, and therefore I have thought proper, without anticipating their report on mine, to synoptisize a few of the facts elicited by those experiments, and principally such as will enable me to compare the "*evaporative power*" of my boiler with those before mentioned.

My boiler, be it remembered, has been in constant use more than two years, and on the trials did nothing but its ordinary every day work, while the others were new ones, I presume, and were certainly kept in special order for their work, and had philosophers to direct the firing.

The *modus operandi* adopted in the experiments will be understood by a reference to the colored plate before referred to, and the following observations.

[But previous to making them, I may be permitted to observe, that the tank method, or any other by means of which the water can be correctly measured into the boiler under examination, is the only correct preliminary to the obtaining of correct results, because, whatever may escape by steam leakage is just as much "evaporative effect" as that which is collected. Nay, even the water leakage of the *boiler* is so too, provided the heat from it dries it up and does not permit its collection.

* Why are not these reports, accompanied as they generally are, with correct drawings of the apparatus, published by the Secretary of the Navy? Some of them are invaluable. I may say, from the little that is known of them, that they are probably the most invaluable reports which our Government is in possession of on any one subject. Will not some of our Senators call them up, and redeem these invaluable papers from oblivion?

The main condenser was known to be much larger than necessary, inasmuch as the water flowing through it unchecked, would reduce the temperature so low as entirely to remove any pressure (above that of the atmosphere) in the exhaust steam pipe.

As no steam of any account would, under these circumstances, come from the bottom connexion of the main condenser with the reservoir, to interfere with the collection of the water of condensation therein, a cock was put into the reservoir at the same time that every other communication was cut off.]

The steam being allowed to leave the boiler and pass through the engine, deposited any oil, water, and any other substance heavier than steam in the "dirt trap." (NOTE.—The "dirt trap" varied a little from the one shown as the steam first struck an oblique plate forming one side of it, and had to ascend vertically before entering the condensing apparatus, thus rendering it impossible for anything but *pure steam* to obtain access thereto,) while the clean steam passed on becoming condensed in the main condenser, filled the reservoir below it up to the cock before mentioned. The water level in the boiler being noted, state of the fire, weight of coal to be supplied from, steam pressure and temperature of steam and water in boiler, temperature of feed water, and other observations amounting in all to about seventeen were taken every fifteen minutes.

We commenced to draw off the water of condensation from the "reservoirs" into a measure holding 8 lbs. of water, and poured its contents, when full, into a funnel fitted for the purpose of conveying the water to the feed pump, a mark being made for each 8 lbs. poured in under the *strictest* supervision.

Whenever the water-line in the boiler got lower than the level fixed upon, cold water was added to bring it up. Where this additional water went to was a matter of surprise, for not a particle of steam could be discovered leaking from the boiler, but as the supply required increased with the boiler pressure, it may be that the principal escape was there. There are, however, several connexions where a slight escape of steam was visible under a pressure of 210 lbs., at which sometimes the boiler blew off in consequence of stoppages; boiler water will waste very rapidly, although scarcely perceptible to the eye or ear. There was a little water overflow at the feed pump, but of no collectable amount. Blowing through the cylinder twice every fifteen minutes in taking indicator cards, would, I am sure, waste more than all the water which escaped from this source. The presumed greatest source of water escape on the first day was the suction pipe of the feed pump, which was under a pressure of only 3 to 4 feet of water; that was remedied, but the deficiency of water was increased on the next day, showing that the leakage was somewhere else, for it increased with the increase of pressure. The boiler stands upon four legs, is clear all around it, and admits of thorough examination. These are the reasons why I claim that all the water which entered the boiler was evaporated in effect by the action of the fuel consumed.

Prosser's Patent Boiler and Condenser.

Synopsis of the performance of the boiler and condenser, while under charge of a Board of United States Engineers appointed by the Hon. Isaac Toucey, Secretary of the Navy, and consisting of B. F. Isherwood, Esq., senior member of the Board, and late Chief Engineer of the war steamer "*San Jacinto*," J. W. King, Esq., Chief Engineer of the Brooklyn Navy Yard, and Wm. E. Everett, Esq., late Chief Engineer of the war steamer "*Niagara*."

These trials of the boiler and condenser were continued during six days, occupying eight consecutive hours of each day, but this synopsis embraces only the two last of those days, and will doubtless be found to agree with the Report of the Board when forthcoming, so far at least as they may be comparable with each other.

Synopsis.

Averages of observations taken every fifteen minutes.

Notes.			Steam Full pressure	Steam Expand 2 7-9th times.
	The Manometers used were made by the Novelty Works. Temperature of the atmosphere from 70° to 80° Fah.	1859	April 29.	May 3.
	Coal consumed per hour on each foot of grate surface in	lbs.	16	16
	Load on safety valve of boiler per square inch,	"	150	210
	Total pressure of steam in boiler "	"	145	157
a.	Superheat of the steam in the boiler above the water,	F.	17°	49°
	Lowest total pressure in the steam chest per square inch,	lbs.	51	118·7
	Highest " of the exhaust steam "	"	16	16·4
	Initial pressure of unbalanced steam in the cylinder,	"	35	102·3
b.	Weight of water collected from *steam* condensed after passing into the condensing apparatus per pound of coal consumed,	"	10·019	9·8928
c.	Weight of water collected from *steam* condensed before entering condensing apparatus (in dirt trap),	"	·012	none.
d.	Weight of water added to keep up the water level in boiler "	"	·750	·9642
e.	Weight of water evaporated per pound of coal consumed,	"	10·781	10·857
f.	Temperature of exhaust steam in heater cistern,	F.	212·36°	213·64°
f.	" of feed water previous to entering the heater,	"	122·°	148 °
f.	" increased by passing through the heater,	"	62·3	38·8
f.	" of the feed water entering the boiler,	"	184·3	186·8
	CALCULATION FOR EVAPORATION. Centigrade Thermometers made expressly for the purpose by Tagliabue.			
	Weight of water forced into the boiler by the feed pump (first hour of last day lost),	lbs.	2760	2432
	Weight of coal consumed in the evaporation thereof in eight and seven hours respectively,	"	256	224
	Weight of water evaporated from 84·6° C. to 175° by one pound of coal as above,	"	10·781	
	Weight of water evaporated from 85·96 C. to 183·5° by one pound of coal as above,	"		10·857
	Total heat in atmospheric steam above 100° C. =	C.	537·°	537·°
	" of feed water less than 100° C. (—84 6),	"	15·4	
	" " " (—85·96),	"		14·04
	Superheat of *steam* above the water reduced to its equivalent in proportion to its specific heat,	"	8·	23·
	Total heat in steam at 175° C. above that at 110° C.,	"	19·85	
	" " 183·5° C. " "	"		22·46
	" absorbed from the combustion of the fuel,	"	580·25	596·5
	Divided by 537° gives coefficient of the real evaporative effect,		1·0805	1·1108
	Which multiplied by the observed evaporation as above,		10·781	10·857
	Gives an evaporative effect from 100° C. per pound of coal of	lbs.	11·65	12·06

Notes on the foregoing Synopsis.

a. Superheating the steam and its effects.

These quotations are the best approximations attainable. The thermometers could not be put exactly into either the water or the steam of the boiler, and an allowance is therefore made to bring the temperature up to correspond with the pressure.

If this steam was not pure, where are we to obtain it? Surely not from the *test* boilers, either American or English, which I have described, unless indeed we are prepared to back the *gross* insinuation, that the tables used to show the relative volumes of steam and water may possibly be wrong to the extent of even "*one-half.*"*

The increased amount of superheat in the steam on the last day, may be accounted for by the fact, that the smoke tubes and passages were thoroughly swept out the day before, whereas, on the first day's trial they had not been swept for two weeks.

Superheating the steam is one of the main objects of the boiler arrangement, at the same time it is believed to be the lightest, strongest, and most effective steam (real steam) generator ever produced. This is the boiler referred to in this *Journal*,† and with which I challenged any boiler in the United States to compete. It has now been more than two years in constant use; it is not in the least impaired, and is fully adequate to the bursting of any other boiler in existence that I know of.

Nearly all tubular boilers are known to prime badly. That is their greatest fault, and yet, we find the evaporative effect of boilers tested in such a manner as to induce the belief that priming was a desirable qualification, and those boilers which primed the most are usually extolled as evaporating the most.

The water being measured from a tank and pumped into the boiler, the sooner it was got out again through the cylinder, the better for the character of the boiler.

The remedy for priming is undoubtedly superheating the steam. There is no priming when that is properly effected.

b. It is not so much the water that goes into the boiler which is of any importance, but *the steam which can be caught uncondensed after it has left the cylinder* that we want to know about, for that is the steam, and that only, which has done the work. Of course, it is not possible with a jet condenser to ascertain this, and the only alternative is to measure it by the indicator.

The system which I here recommend is entirely trustworthy, for, between the cylinder and the condenser, with the means of separating the steam from the water, from whatever source the latter may be derived, there can be no possible source of error unless it be against the boiler, because, even if the condenser is leaky, the pressure on the inside of it being greater than on the outside, the condensed steam will be blown out rather than the condensing water drawn in.

To this test for evaporation my boiler has been subjected, and it is not too much to say, that there are many boilers of fair repute which will not furnish steam of equal efficacy with double the amount of fuel.

This water is from pure steam beyond all cavil. It is the first time to my knowledge, that the test of collecting the steam alone and condensing it, has ever been applied to the verification of the tank system of measuring the water before entering the boiler. I think it much more accurate than the indicator method.

The experiments were undertaken to test the boiler and condenser, and not the steam engine; the latter was merely made use of as a medium to pass the steam from the boiler, but was not indispensable or even necessary, except as furnishing the power necessary to pump back the water of condensation into the boiler.

To submit to the arbitration of the indicator, is to add all its faults and deficiencies to those of the engine, boiler, and condenser, whatever they may be, which the boys would call "going it blind."

It may be as fair for one as another of the same breed of boiler and condenser, but who puts his full-blooded courser to pull against a cart horse? My boiler produces undeniably pure and superheated steam; use it and let me have it back to condense and return to the boiler again as pure as the mountain dew. But what have I to do with the want of skill in the user of it, or with any fanciful mode which may be adopted of testing its power?

Even if the steam engine and the indicator were both perfect, there can be no benefit derived from their use, as mere measures of the weight of steam passed, for we obtain the absolute *steam* condensed into water to weigh and to measure as we please; all the loss is against the boiler, there can be no other error. No other system admits of this

* Indicator and Dynamometer by Main & Brown, page 32.

† Vol. xxxiv, (3d Series,) pages 201 and 202.

absolute certainty, nor, indeed, of any approach towards it, and hence the imperfect instruments which are indispensable to the testing of their power, only insures error in this case where truth is much more easily obtained by other means.

For, where a pound of steam has any fixed value, and we are sure that we get it, we are in possession of a *fixed standard*, with which no other can compare for accuracy.

c. This shows, that the superheat of 17° F. to steam of 145 lbs. total pressure, is nearly sufficient to prevent the appearance of water in the "*dirt trap*," and therefore for all practical purposes we may consider that 10 lbs. of steam may be calculated upon from 1 lb. of coal, of a quality usable, with as much certainty as a permanently elastic fluid, for it is quite obvious that there need be no condensation in the cylinder.

Now let it be insisted upon, that the question of the pressure of the steam is comparatively an important one; it is the weight that we want to be sure about, and having got that, a considerable difference of opinion about the pressure will not materially affect results; only allow that it is steam of the quality represented, and then, whether its elasticity is represented by 95 or 100 lbs. to the square inch, will make comparatively but little difference in the result of a calculation of its power, for within any reasonable limits the product of the pressure multiplied by the volume will show little variation, for what is gained in pressure will be nearly lost in volume.

d. The difference in these quantities is doubtless owing to the increased tension of the steam causing more steam leakage somewhere, and if within the boiler, then to the improvement of the draft, and much cheaper than by the blast-pipe. But the leakage is a mystery nevertheless, for if a boiler like this one leaks almost imperceptibly from 7·8 to 8·6 per cent., what must ordinary boilers leak? There is a well-grounded suspicion that *steam boilers leak far more than is generally imagined*, even when not a drop of water is visible. This alone seems to account for the large quantity of recuperative supply, which every boiler connected with a surface condenser is reported to require, and may also relieve the boiler of the "*Bee*" of a portion of the obloquy attached to it.

e. Even this amount exceeds any well authenticated *real* evaporative effect ever produced by any boiler, in ordinary working and without priming, and yet we have to add several items to it, before it is fairly placed for comparison with the two boilers before mentioned, to wit: the deficient temperature of the feed water, the increase of heat (superheat) in the steam beyond its normal amount, and also the additional total heat in the high pressure steam which was produced. These two last items effectually prevent condensation in the cylinder, and therefore supersede the necessity of superheating the steam by a separate apparatus, or of surrounding the cylinder with a steam jacket, for it accomplishes their work in a far more economical manner, with entire safety, efficiency, and convenience.

f. It has already been explained, that these temperatures were kept down, for the purpose of conveniently withdrawing the water of condensation. This occasioned considerable reduction in the temperature of the feed water, which in the ordinary way of working is actually 200° F., and although it may be increased, the conviction now is, that a higher temperature is not desirable at present, for when working thus, the exhaust steam has sufficient tension to go over into the still and produce distilled water of twice the weight of fuel consumed, which is deemed sufficient for any emergency.

(To be Continued.)

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*Lubricating Railway Brakes.**

According to an invention patented for a correspondent by Mr. Johnson, it is proposed to use, in connexion with any suitable lubricating apparatus, a capillary pad or cushion composed of wool, cotton, or other suitable material, and combined with a metallic conducting spout, which is pressed against the underside of the enlargement or shoulder of the journal of the axle or shaft. This pad sucks up the excess of oil which always collects at that point, and causes it to return either to the elevator or reservoir, so that there will be no waste of oil beyond a few drops occasionally. The pad should always be placed above the level of the oil, so that it will remain in a comparatively dry state.

*From the London Mining Journal No. 1236.

For the Journal of the Franklin Institute.

Experiments made by order of the Navy Department to Determine the Relative Advantages and Disadvantages of the Horizontal Fire Tube, and of the Martin Vertical Water Tube Boiler on board the U. S. Steam Frigate "San Jacinto."

When the U. S. Steam Frigate "*San Jacinto*" returned to New York from her late three years' cruise in the East Indies and the China Sea, a survey was held on her old flue boilers, and their condition was found to be such that it was deemed judicious to replace them with new tubular ones. A convenient opportunity was thus furnished to make a test of the comparative evaporative efficiency of the two competitive kinds of tubular boiler, and the vessel was accordingly fitted by the Navy Department with one horizontal fire tube boiler and one vertical water tube boiler; they have recently been experimented with by a Board of Chief Engineers, whose report is given below. It will be interesting to preface that report with a short description of the old boilers in order that the results of the change may be correctly appreciated.

The old boilers were three in number and of copper. They were of the double return drop flue type, and were placed in the vessel side by side with one chimney in common at the end opposite the furnaces. The fire room was $8\frac{1}{2}$ feet wide and extended athwartship.

Length of each boiler,	25 feet 6 inches.
Breadth "	9 " 9 "
Height " (exclusive of steam chimney,)	10 " 6 "
Number of furnaces in each boiler,	2.
Width of each furnace,	4 " $2\frac{1}{2}$ "
Length of fire grates,	7 " 9 "
Total grate surface in the three boilers,	197·8 square feet.
" heating " "	5250· "
Aggregate cross area of the upper row of flues in 3 boilers,	35·133 "
" " middle " "	33·008 "
" " lower " "	32·146 "
Cross area of the chimney,	34·039 "
Height of the chimney above the grate bars,	55 feet.
Capacity of steam room in the three boilers,	2440 cu. ft.
Weight of the three boilers without chimney and grate bars,	213,256 lbs.
Weight of water in the three boilers at 12 inches above flues, and at 250° Fahr.,	121,200 "

With these boilers during the last three years' cruize of the vessel in the East Indies and China Sea, there was obtained the following mean results, namely:—

Number of pounds of Pennsylvania anthracite consumed per hour,	2115·00
" " " " per sq. ft. of grate,	10·69
Waste in ashes, clinker, and fine coal,	25 per centum.
Pounds of water evaporated per pound of anthracite from tem. of 100° F.,	6·00
" " " combustible " "	8·00

The economic evaporation by the new horizontal fire tube boiler, according to the experiments referred to, exceeds the above by $11\frac{1}{5}$ per centum, making the comparison by weight of combustible; and by $11\frac{1}{2}$ per centum if it be made by weight of coal: while the evaporation by the vertical water tube boiler exceeds it by $31\frac{3}{4}$ per centum per

unit of weight of combustible; and by $29\frac{4}{5}$ per centum per unit of weight of coal.

By the change of boilers the ship carries in the same space as originally allotted to the machinery and fuel, 40 tons more coal, increasing the quantity from 320 to 360 tons.

The aggregate weight of the original boilers and water was $149\frac{3}{10}$ tons; with the present boilers this weight is $115\frac{7}{10}$ tons.

It will be perceived that while with the present boilers, the aggregate weight of boilers, water, and fuel exceeds the aggregate weight of the original boilers, water, and fuel by only $6\frac{2}{5}$ tons, the time that the vessel can steam at the rate of 175 geographical miles per twenty-four hours, has been increased from 14 to 18 days.

The original boilers were about eight years old, and the middle and lower return flues and their connexions, comprising about two-thirds of the total heating surface, were covered during the whole cruize with old scale varying from $\frac{1}{16}$ to $\frac{1}{8}$ inch thick. This surface was inaccessible for scaling, and from the condition of the seams it would have been injudicious to have attempted it. No new scale was formed during the cruize, as the surface condenser operated satisfactorily.

Navy Yard, New York, June 24, 1859.

Hon. Isaac Toucey, *Secretary of the Navy.*

Sir:—In obedience to your order of May 17th, 1859, the undersigned have experimented with the vertical water tube and the horizontal fire tube boilers on board the U. S. Steamer "*San Jacinto*," in the manner and for the purpose therein directed: and have the honor to submit the details of the experiments and their results in the following REPORT.

Before giving an account of the manner of conducting the experiments, and the data obtained—it will be satisfactory to preface it with the following brief description of the boilers and engines employed.

Boilers.—The two boilers had precisely the same shell, both as regards form and dimensions. Also, the furnaces, ash-pits, doors, and smoke connexions were precisely alike, and the grate bars were cast from the same pattern. The minimum calorimeter or area for draft through the tubes was likewise the same in both boilers; the fire grate surface employed was of the same area; and both boilers delivered in common into one smoke pipe, placed at the centre of their length, and immediately over the fire room. The boilers were situated in the vessel face to face, with a fire room $8\frac{1}{2}$ feet wide between them, and extending in the direction of the vessel's length.

As regards dimensions, the only difference between the boilers was in the heating surface, which was considerably the greatest with the vertical water tube boiler.

As regards design, the only difference between the boilers was in the arrangement of the tubes, which in one, was according to the type known as the English tubular or the horizontal fire tube boiler; while in the other, it was according to the patent of Chief Engineer, Daniel B. Martin, U. S. N., and is of the vertical water tube type:

In both boilers the relative positions of tubes and furnaces are the same, the tubes being placed immediately over the furnaces; and in both boilers the tubes occupy sensibly the same space, namely: a length of 7 feet, a breadth of 3 feet, and a height with the horizontal fire tubes of 37 inches, and with the vertical water tubes of 33 inches; but this difference of 4 inches is compensated by the greater distance between the tubes and furnace crown indispensably necessary with the latter.

The comparative dimensions and weights of the boilers will be found in the following Table:

Dimensions and Weights of Boilers.

	English horizontal fire tube boiler.	Martin's vertical water tube boiler.
Width of boiler (fore and aft direction of the vessel,) in feet and inches, ...	21 3	21 3
Length of boiler (athwartships) at furnaces in ft. and ins.,	10 6	10 6
" " " extreme " "	11 6	11 6
Height of boiler exclusive of steam chimney in ft. and ins.,	11 3	11 3
" inclusive " " "	13 3	13 3
Number of furnaces, ...	6	6
Width of fire grate in each furnace in feet, . .	3	3
Length " " . . .	6	6
Aggregate area of fire grate surface in square feet, .	108	108
Heating surface in the six furnaces, in square feet,	289·20	289·20
" " back smoke connexion, "	159·36	119·36
" " front " "	136·40	106·40
" " tubes measured on their exterior circumference in square feet,	2282·67	2332·64
" " tubes measured on their interior circumference in square feet,	2078·92	2111·00
" " sides, tops, and bottoms of the tube boxes in square feet, .		447·65
Total heating surface, the tube surface being measured on the exterior circumference in square feet, .	2867·63	3295·25
Total heating surface, the tube surface being measured on the interior circumference in square feet, .	2663·88	3073·61
Number of brass tubes, ...	414	1620
External diameter of the tubes in inches, .	3	2
Internal " "	2·732	1·810
Length, in inches of the tubes, extreme, . .	84¼	33
Thickness of metal of the tubes in inches, . .	0·134	0·095
Weight of the tubes in pounds, . . .	10115	9856
Calorimeter or area for direct draft through the tubes in square feet, ...	16·854 16·854	16·889 front 21·555 back.
Diameter of smoke pipe in feet and inches, .	6 4	6 4
Height " " " above fire grate,	51 6	51 6
Steam room measured from nine inches above top of tubes in cubic feet, ...	735	776
Weight of water in boiler at 250° Fahr., measured from 9 inches above top of tubes in pounds, . .	46600	39200
Weight of boiler exclusive of water, grate bars, and valves, but inclusive of tubes in pounds, . .	86412	86860
Length occupied by the tubes in each boiler in inches,	84¼	84¼
Height " " "	37	33
Space between crown of furnace and bottom of tubes in inches, ...	7	9

Engines.—The engines are geared, and the cylinder valves are of the usual double poppet kind. The steam is cut off by the steam valve with the adjustable arrangement patented by Allen & Wells. The two cylinders are connected upon the driving shaft at right angles to each other; and they have in common one surface condenser constructed according to the patent of J. P. Pirsson.

The following are the dimensions required to be known in connexion with the experiments, namely:—

Diameter of the forward cylinder, . .	$70\frac{1}{8}$ inches.
" after " . .	$70\frac{3}{8}$ "
Stroke of piston of both engines, . .	4 feet.
Aggregate area of both pistons, . .	7752 sq. ins.
Space displacement of the pistons of both engines per stroke,	215·33 cu. feet.
Space comprised between pistons and cut-off valves at one end of both cylinders, . .	9·61 "
Total space filled with steam of the final cylinder pressure, per stroke of both pistons, . .	225·94 "

Mode of Conducting Experiments.—The experiments were made to determine the *relative* evaporative efficiencies of the two boilers under the conditions of actual practice on board marine steamers. For this purpose a short experiment would be valueless from the impossibility of knowing whether the condition of the fires was exactly the same at the commencement and at the end—from the inequality in firing—from the different proportions of refuse found even in different shovelfulls from the same heap of coals—from fluctuations in the draft—from the losses by cleaning the furnaces—and from the different quantities of air in proportion to fuel admitted at different times. It was, therefore, considered necessary that the experiments with each boiler should continue uninterruptedly four days or ninety-six hours. The weight of water evaporated was to be ascertained from the steam pressure in the cylinder at the end of the stroke of piston as given by the indicator. The cost of this evaporation was the weight of combustible consumed; by combustible is meant the remainder of the coal after deducting the refuse withdrawn from the furnaces as ashes, clinker, and fine coal.

The evaporation as thus determined, though relatively correct, is not absolutely so; because it is exclusive of the steam condensed in the boiler, in the steam pipes, in the cylinders, &c., and of the loss of heat by priming and leakage; but on the other hand, the evaporation measured by water in a tank previous to its entering the boiler would also be incorrect from the loss by priming and from leakage. The tank measurement gives too great an evaporation, the indicator measurement too small a one; but the latter is the most useful practically, because the most convenient and habitually employed; in effect, it is only comparative results that could be obtained in either case, and they are all that are practically needed.

The experiments were conducted in precisely the same manner with both boilers, and as follows, namely: At the commencement no account was taken of the coal required to raise steam, or of the temperature of the water in the boilers; but after steam was raised to 22 lbs.

per square inch pressure above the atmosphere, the level of the water in the boilers was noted, the condition of the fires estimated as nearly as possible by the eye, and the engines started. At the end of each experiment, the water in the boiler and the condition of the fires were left as at the commencement. The experiments with both boilers were begun and ended at mid-day, and continued uninterruptedly ninety-six hours. During that time, the boiler steam pressure and the vacuum in the condenser by barometer gauges were noted every fifteen minutes, and at the close of each hour there was recorded for that hour the mean steam pressure, vacuum, temperature of engine and fire-rooms, of the salt and fresh water hot-wells, and of the injection water; also the weight of coal thrown into the furnaces, and the weight of dry refuse in ashes, clinkers, and fine coal withdrawn. Each hour an indicator double diagram was taken from both cylinders, and from the mean of the final pressures as given by these diagrams the evaporation was calculated. Owing to excessive condensation in the cylinders and the continual discharge by their relief valves of the resulting fresh water, the surface condenser gave a deficit of one-sixth, that is to say, it returned to the boiler as distilled water, five-sixths of the steam leaving it. At the commencement of each experiment the boiler was filled with sea water, and at the expiration of every hour the saturation was recorded, and also the number of inches in depth of water blown off to maintain it at $1\frac{1}{2}$ times the natural concentration. Every pound of the coal and refuse was carefully weighed by a steelyard. The number of double strokes made by the piston was taken by a self-registering counter. The indicators were excellent instruments, and every precaution was taken to insure exact similarity of circumstance with both boilers. The cut-offs set to cut off the steam in the cylinders at $\frac{48}{100}$ of the stroke of piston from the commencement, were secured to prevent accidental alteration. The throttle (a butterfly valve) was kept unchanged at two holes open, eight holes being wide open. The same fireman fired both boilers and the same assistant engineers directed them.

The experiments were first made on the horizontal fire tube boiler; they were begun at noon on the 10th of June, and after being completed, the steam was shut off from it and let on from the vertical water tube boiler without stopping the engines. The piston and cylinder valves of both engines on being tried at the termination of the experiments, noon June 18th, exhibited no sensible amount of leakage.

The coal used was hard Pennsylvania anthracite of very indifferent quality, giving for a mean with slow combustion and careful firing, the excessive amount of over 25 per centum of dry refuse.

In the following Table will be found the complete data and results of the experiments:

Data and Results of the Experiments.

DATA.	English horizontal fire tube boiler.	Martin's vertical water tube boiler.
Duration of the experiments in consecutive hours, .	96	96
Total number of double strokes of pistons made by the engines per counter, ...	62518	64196
Mean number of double strokes of pistons made per miuute by engines, ...	10·854	11·145
Mean pressure of steam in boiler in pounds per square inch above atmosphere, ...	10·43	11·41
Mean vacuum in condenser in inches of mercury, per barometer gauge, ...	21·48	20·80
Total number of pounds of anthracite consumed, .	100436·00	92512·00
" " refuse in ashes, clinkers, and fine coal, . .	24908·00	24178·00
" " combustible consumed,	75528·00	68334·00
Per centum of the anthracite in refuse, . .	24·80	26·14
Mean pressure above zero, per indicator, in pounds per sq. inch, of the steam in cylinders at commencement of stroke, ...	19·44	10·40
Mean pressure above zero, per indicator, in pounds per sq. inch, of the steam in cylinders at point of cutting off,	16·40	17·20
Mean pressure above zero, per indicator, in pounds per sq. inch, of the steam at end of stroke of piston,	9·11	9·50
Mean gross effective pressure on pistons in pounds per sq. inch, per indicator, ...	9·18	9·63
Mean back pressure above zero against pistons in pounds per square inch, per indicator, . . .	5·50	5·75
Mean gross horse power developed by the engines,	187·25	201·696
Mean number of pounds of anthracite consumed per hour,	1046·21	963·67
" " " " per square foot of grate, ...	9·687	8·923
Mean temperature in degrees Fah. of the engine room,	96	106
" " " on deck, . .	61	74
" " " of the fire room,	99	112
" " " salt water hot-well,	100	102
" " " fresh "	100	100
" " " injection water, .	62	65
Total number of pounds of water blown out of boiler to keep the saturation at $\frac{1\frac{1}{2}}{32}$.	68424	123144
RESULTS.		
Number of pounds of water evaporated from feed water temperature of 100° Fah., calculated from the steam pressure in cylinder at end of stroke, . .	663629·007	705468·426
Number of pounds of water evaporated from feed water temperature of 100° Fah., due to the weight of boiler water blown off, ...	8183·448	14857·488
Total number of pounds of water evaporated from feed water temperature of 100° Fah., . . .	671813·455	720325·914
Pounds of water evaporated from feed water temperature of 100° Fah. by one pound of anthracite, . .	6·689	7·786
Pounds of water evaporated from feed water temperature of 100° Fah. by one pound of combustible, . .	8·895	10·541

Comparative advantages and disadvantages.—We are directed by your order to report to the Department the relative advantages and

disadvantages of the two kinds of boiler as regards space occupied, weight, cost, accessibility for cleaning and repairs, durability, evaporative efficiency, and the relative quantities of steam that can be furnished in equal times.

1st, *As regards space.*—In the particular specimens experimented on, the space occupied by both types of boiler was equal; but not so the area of contained heating surface. If the proper measure of that surface be, as we think it is, the extent exposed to the reception of heat from the products of combustion, then the heating surface in the vertical water tube boiler exceeded that in the horizontal fire tube boiler by nearly $23\frac{3}{4}$ per centum of the latter. If, however, it be measured by the extent from which water is evaporated, then the superiority will still remain with the vertical water tube boiler but reduced to $7\frac{1}{5}$ per centum.

2d, *As regards the weights of the two boilers.*—By referring to the table of their dimensions and weights, it will be seen that in this respect the experimental boilers were nearly equal, the horizontal fire tube having a slight advantage in lightness; but if the aggregate weight of boiler and contained water at a steaming level be compared, then the vertical water tube has a superiority of nearly $5\frac{1}{4}$ per centum over its competitor.

3d, *Cost.*—In this particular the horizontal fire tube boiler is slightly the cheapest, but the difference is unimportant.

4th, *Accessibility for cleaning and repairs.*—For the removal of scale or any insoluble sediment on the water surfaces of the tubes, the vertical water tube boiler has a decisive superiority, from the complete and easy manner in which the entire of those surfaces can be reached by a scaling tool and cleaned mechanically. With the horizontal fire tube boiler, this operation is very tedious and difficult, and at the best is only partial. It may, indeed, be said, that the whole of the horizontal tubes cannot be scaled without the removal of a portion of them; and from the fact of their becoming more and more coated with scale as their age increases, their evaporative efficiency will be continuously impaired to the extent of the loss of heat thus intercepted. On the other hand, the horizontal fire tubes are much more easily and completely swept of soot and deposit from the furnaces; they are also more easily plugged when leaking. Furthermore, they are only about one-fourth the number of the vertical water tubes, and the liability to leakage is correspondingly lessened, but this liablity is so trifling as to be of no value in a practical estimate. The remaining portions of both boilers are equally accessible for cleaning and repairs.

5th, *Durability.*—We have no data on which to base an opinion in this respect, but we believe both boilers to be about equal.

6th, *Evaporative efficiency.*—The relative evaporative efficiency as given by the experiments, applies rigorously only to the particular specimens of the types of boiler employed, with their peculiarities of proportion, and under the conditions of the trials. Under other conditions, and with other proportions, the relative evaporative efficiency would doubtless be different, and in direction as determined by better or worse

proportions, and by conditions more or less favorable for one kind of boiler over the other. The proportions given to both boilers in the present case, however, are such as are now generally approved in practice.

With these proportions, and under the actual conditions of the trials, the evaporative efficiency of the vertical water tube boiler exceeds that of the horizontal fire tube by $18\frac{1}{2}$ per centum of the evaporation of the latter, making the comparison by weight of combustible consumed; and by $16\frac{3}{5}$ per centum if the comparison be made by weight of coal consumed; the former is, of course, the proper result.

7th, *Relative quantities of steam that can be furnished in equal times by the two boilers.*—In this respect the superiority remains with the horizontal fire tube boiler in which the combustion of the fuel can be forced to a considerably greater extent than in the vertical water tube boiler. The additional steam, however, thus obtained, will be at a greater *pro rata* cost of coal; but we have no data to determine either the increased quantity or its increased cost.

Finally, in view of the much greater evaporative efficiency of the vertical water tube boiler, and of the facility and completeness with which it may be scaled—the two qualities of paramount importance with marine boilers—we would express our decided opinion that its superiority over the horizontal fire tube boiler is so strongly marked as to unquestionably entitle it to the preference.

We have the honor to be, sir, with great respect,

Your obedient servants,

B. F. Isherwood, Wm. E. Everett,
James W. King, John Faron,
Chief Engineers, U. S. N.

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*On the Relative Values of Coke and Coal in Locomotive Engines.**
By Benjamin Fothergill.

Having attended a meeting in the Society's rooms, on 2d December, 1857, and taken part in the discussion relating to the use of coke and coal in the furnaces of steam engine boilers, I then undertook to lay before its members the results of a series of experiments which I had made with coke and coal in locomotive engines in corroboration of the truth of my assertions:

First, That coal was decidedly superior to coke in respect to heating power, and consequently more economical.

Second, That a plentiful supply of steam could be generated by the use of coal for working engines at high velocities and for drawing heavy trains.

Third, The capabilities of coal-burning engines for consuming their own smoke: and,

* From the Jour. of the Society of Arts, No. 339.

Fourth, The increased durability of fire-boxes and tubes when coal was used.

On that occasion I stated, that my experiments had been conducted upon the London and South Western Railway, and were made, at the request of the directors, to ascertain the value of an invention which had been patented by their Locomotive Superintendent, Mr. Joseph Beattie. This contrivance will be readily understood by referring to the drawings on the walls, where the fire-box is shown in section, divided transversely into two compartments by an inclined water space mid-feather or diaphragm, and a dependent water space hanging from the roof. Both compartments are arched over with fire tiles at narrow intervals apart. The boiler is constructed with a combustion chamber, extending to about one-half its length, and it has a vertical mid-feather or diaphragm in the centre running parallel with its sides. The other half is supplied with tubes in the ordinary manner. The object of this contrivance is to increase the amount of direct heating surface and to diminish the indirect or tube surface, whilst the combustion chamber affords sufficient space for the introduction of a series of fire tiles, for the purpose of retaining a portion of the heat given off from the combustion of the gases in the fire-box, and for diffusing the unconsumed carbon as well as effecting a complete mixture of the air with the gases, and thereby producing a mass of flame which is brought in contact with the direct heating surface of the combustion chamber before it enters the tubes, at the same time preventing practically such an escape of smoke from the chimney as could be deemed a nuisance.

The back or first furnace is the most actively worked, the second being intended to carry incandescent fuel. The ash pans are furnished with dampers for the admission of air when necessary; and this is also admitted through the small apertures in the fire doors and through hollow stays in the fire-box.

In addition to the mechanical contrivances referred to, Mr. Beattie has another of considerable importance for using a portion of the exhaust steam for heating the feed water before it enters the boiler, and as I have tried both his contrivances for this desirable object, I need only refer to the one represented on the drawing, which shows the pipes for conveying the water and steam to the tank under the foot-plate of the engine, from which the feed-pumps receive their supply. The water is received on to a perforated plate in this tank, and in its descent comes in contact with and condenses the steam, and thereby becomes heated; the supply of water is regulated by the ball-tap or valve, and the steam is admitted or shut off whenever the engine driver has occasion to supply or shut off the feed-water to the boiler.

In the course of my first series of experiments, I have used the feed-water supplied by Mr. Beattie's apparatus, at a temperature of 196°.

I may here observe that I was anxious to obtain an analysis of the fuel used by the London and South Western Railway Company, and the more so as I found they manufactured their own coke from "Ramsay's Coking Coal" (Newcastle), which is of a superior quality; and

as it was desirable to ascertain, as far as possible, whether the coke or the coals which were supplied to me contained the greatest amount of sulphur, I sent samples of each to Mr. Dugald Campbell, Analytical Chemist to the Brompton Hospital, and he, after a careful examination, furnished me with the following statement, viz:—

"The samples I received were four in number, and marked as follows:—

No. 1.—Ramsay's coking coal.
No. 2.—Coke.
No. 3.—Llanguathog Merthyr, shipped Swansea, Neath, and Cardiff.
No. 4.—Griff coal.

"No. 1.—Ramsay's Coking Coal—Is of a jet sparkling appearance, and is broken up without much difficulty by the fingers into rather thick layers, between most of which are thin plates of iron pyrites, which, I may state, is a compound of iron and sulphur, in the proportion of one of the former to two of the latter. When the coal is reduced to a very fine powder—in which state it is required for analysis—its jet black appearance gives place to a considerable brown tint, which indicates it to be of a bituminous character.

"This coal is rather above the usual density of Newcastle coal, being 1279, water taken as 1000.

"The analysis in 100 parts is as follows:—

Carbon,	85·57
Hydrogen,	5·68
Oxygen,	3·07
Nitrogen,	1·48
Sulphur,	1·46
Moisture,	0·74
Ash,	2·00
	100·00

"The calorific value of a substance is generally estimated in two ways; firstly, by calculating from its ultimate analysis what qnantity of water a known weight of the fuel would evaporate from 212° Fah.; and, secondly, by ascertaining how much oxide of lead is capable of being reduced to the metallic state by a known quantity of the fuel.

"These experiments when conducted upon the different specimens of fuel under precisely similar circumstances, which has been the case in this instance, give results extremely useful for comparing the economic value of the fuel. By such means, 1 lb. of No. 1 Ramsay's coking coal was found to be capable of evaporating 15·18 lbs. of water from a temperature of 212° Fah., and 1 lb. of reducing 34·99 lbs. of metallic lead from the oxide.

"No. 2.—Coke made from Ramsay's Coking Coal.—The specimen I received of this substance was a thin column, which, from its appearance, must have occupied a space from the top to the bottom of the coke in the coking furnace. An average sample was selected from this for examination, and the results obtained were as follows:—

"Density of coke 1055, water being 1000. The analysis in 100 parts,

Carbon,	86·91
Hydrogen,	1·32
Oxygen,	0·10
Nitrogen,	0·80
Sulphur,	1·94
Moisture,	1·28
Ash,	7·65
	100·00

"One pound of this coke is capable of evaporating from 212° Fah. 12·78 lbs. of water; and 1 lb., of reducing from the oxide of lead 31·35 lbs. of metallic lead.

"No. 3.—Llanguathog Merthyr.—This coal has a bright sparkling appearance, resembling to some extent (No. 1) Ramsay's coal; but it is rather more dense, and not so easily broken; when broken, however, the layers are not so thick, and between them no iron pyrites are visible, but thin plates of silicate of lime are occasionally noticed.

"Density of coal 1333; water 1000. The analysis in 100 parts,

Carbon, . . .	89·16
Hydrogen, . . .	4·06
Oxygen, . . .	1·65
Nitrogon, . . .	1·21
Sulphur, . . .	1·39
Moisture, . . .	0·67
Ash, . . .	1·86
	100·00

"One pound of this coal is capable of evaporating from 212° Fah., 14·74 lbs. of water, and 1 lb. of reducing from the oxide of lead 34·74 lbs. of metallic lead.

"No. 4.—'Griff' Coal.—This is a coal of a dull appearance, dense and hard, with a concoidal fracture, different from either of the other two coals.

"Density of coal 1341; water 1000. The analysis in 100 parts,

Carbon, . . .	66·21
Hydrogen, . . .	4·09
Oxygen, . . .	11·07
Nitrogen, . . .	1·13
Sulphur, . . .	1·01
Moisture, . . .	9·23
Ash, . . .	7·26
	100·00

"One pound of this coal is capable of evaporating from 212° Fah. 9·8 lbs. of water, and 1 lb. of reducing from the oxide of lead 25·14 lbs. of metallic lead.

"Table of Foregoing Results:—

	No. 1. Ramsay's Coking Coal.	No. 2. Coke from Ramsay's Coking Coal.	No. 3. Llanguathog Merthyr Coal.	No. 4. Griff Coal.
Density, .	1·279	1·055	1·333	1·341
Carbon, . .	85·57	86·91	89·16	66·21
Hydrogen, .	5·68	1·32	4·06	4·09
Oxygen, .	3·07	0·10	1·65	11·07
Nitrogen, .	1·48	0 80	1·21	1·13
Sulphur, .	1·46	1·94	1·39	1·01
Moisture, .	0·74	1·28	0·67	9·23
Ash, . .	2·00	7·65	1·86	7·26
	100·00	100·00	100·00	100·00
Pounds of water which 1 lb. of fuel would evaporate from 212° Fah.,	15·18	12·78	14·74	9·8
Pounds of lead reduced by 1 lb. of fuel.	34·99	31·35	34·74	25·14

"In glancing at the above table, the first thing that arrests the attention is the proportion of sulphur being greater in the coke than in the coal from which it was made, and by nearly half a per cent.

"It appears from my analysis that, although in coking coal there may be a notable loss, in the per centage of carbon, hydrogen, oxygen, and nitrogen, in the coke, yet the sulphur has not only not decreased, but has actually increased in the per centage. I find in the coking oven that not more than one-twelfth of the sulphur goes off from the coal, whilst the loss of the other gases is upwards of one-third of the whole.

"But portions of the coke may be found to contain a very much larger quantity of sulphur than I found in the above specimen, and if I had selected a piece from near the top of the column, instead of taking an average of the whole, I should have found very much more than I did.

"The pieces of coke delivered to me by your assistant, which he told me he had taken from the tender of an engine in going down to Southampton, on the 2d ultimo, gave, on an average, 5·62 per cent of sulphur, and some which I selected myself from the coke-heap at the Nine Elms station gave about 5 per cent.

"The next peculiarity to be noticed between the coke and the coal from which it is made is, in the amount of ash being very much higher in the former than in the latter; this is caused by an excess of iron and silica principally, and were it not for the increase of ash there would not be so very much difference in their heating power, &c. I can only account for this increase in these two substances from their being volatilized in the coking ovens, and entering into the crevices of the fuel from which the gases escape.

"It is common to find large quantities of a hair-like substance adhering to the coke, varying in color from a light grey to black; this is silica, with a trace of carbon and iron, and which has been in a state of volatilization till arrested by coming to a cooler part of the coking oven, where it has condensed, and is found as I have described it.

"No. 3.—Llanguathog Merthyr Coal,—You will observe, is a coal of a very superior quality, and is nearly equal to Ramsay's coking coal in heating power, and has a very little less per centage of sulphur; but No. 4, 'Griff' coal, though containing less sulphur than either, does not possess such heating power, which is partly owing to its containing a large per centage of water; this water is expelled when the coal is reduced to a fine powder, and submitted for some time to a temperature of 212° Fah. The moisture in the other specimens was determined in a similar manner.

"I may state that my experiments were repeated, and great care was bestowed to verify any results which appeared contrary to what should have been expected, such as the larger amount of ash in coke, in comparison to the coal from which it was made, and the larger amount of sulphur in coke than in coal, the general belief being that in the coking of coal most of the sulphur is driven off."

I will now proceed to give a detailed statement as to my mode of procedure to ascertain the quantity of fuel consumed per trip from the Waterloo Station, London, to Southampton and back again, inclusive of the quantity used in getting up steam in the morning, and whilst waiting at Southampton. I personally inspected the weighing of the fuel in the morning, and again at Southampton, and on the return of the engine to Nine Elms I took an account of the coal which remained on the tender, and I had the fire-box cleared out, the hot material cooled and riddled, and the worthless portion separated, and I allowed the value in good coal for the remainder.

I commenced my experimental trips with the coal engine "Ironsides," which had been constructed on Mr. Beattie's patented plans, for burning coal only, and heating the feed-water, and took the 10·15 A. M. mail train from Waterloo to Southampton, and arrived there at 1·5 P. M. We commenced the return journey at 3·0 P. M., and arrived at the Waterloo Station at 5·58 P. M., the engine having performed the trip in the most satisfactory manner, and without any appearance of smoke, except when the steam had to be got up in the morning, or the fires prepared for the return journey.

The result of that day's trip will be seen by referring to the tabu-

lated summary opposite November 15th, where the average consumption of fuel is shown as 16·71 lbs. of coal per mile, or when reduced to its coke value, equal to 11·14 lbs. per mile, with an average load of 12·2 carriages per mile, traveling at an average speed of 31·25 miles per hour.

I have said that the consumption of coal, when reduced to its coke value, was equal to 11·14 lbs. per mile; in explanation of my meaning, I beg to state experience has proved that, in order to make one ton of good coke suitable for locomotive engines, 1½ tons of the best coking coal is required, and with some kinds of coking coal, 1½ to 1¾ tons are necessary to produce one ton of coke. It will be evident then, that if the same load can be taken, at the same velocity and under the same circumstances in respect to weather, with equal weights of fuel, say with coal in engines fitted up with Mr. Beattie's patented contrivance, and with coke in the ordinary class of engines, a net saving is effected of one-third, or 33 per cent., in fuel alone, without taking into consideration the incidental saving consequent on the construction of coke ovens, the interest on capital, the cost of their maintenance, and the wages of workmen employed in the manufacture of coke.

From the tabulated summary it will be seen, that I worked the coal engine "Ironsides" for three days with little variation in respect to the quantity of fuel consumed, that little variation arising from the change in the weather. I then selected the coke-burning engine "Vesuvius," one of the ordinary class, and being nearest in dimensions and weight to the "Ironsides," and in good working order, and with it I took a similar train (10·15) to and from Southampton, burning coke only, and I adopted the same course of proceeding as on the former trips, but with a very different result as regards the consumption of fuel; for, on referring to the general summary, it will be seen that the average load was 12·1 carriages, the average speed 30·27 miles per hour, while the average consumption of fuel was 20·62 lbs. of coke per mile. On the following day I took the "Express" train with the same engine, but the results were substantially the same as on the previous day with the "mail" train.

Having tried the "Vesuvius," I decided upon taking another coke-burning engine (the "Frome,") which was a similar class engine to the "Vesuvius," in order to ascertain if there was any difference in the results of their working. On referring to the summary of the trip opposite November 22d, it will be seen that the consumption of fuel was remarkably near that of the "Vesuvius."

I then determined to test the capabilities of another coal-burning engine, the "Canute," and compare the results of its working the "Express" train with that of the "Vesuvius." The load was lighter, averaging 9·3 carriages, but the average speed attained was higher, being 36·76 miles per hour. The consumption of fuel was 16·71 lbs. of coal per mile, the coke value of which is 11·14 lbs. per mile against 20·62 lbs. per mile consumed by the "Vesuvius."

The experiments up to this period showed a decided advantage in the coal-burning engines, so far as regarded economy of fuel, &c., but

the results were not conclusive to my mind, inasmuch as the engines had not worked under precisely the same circumstances with respect to weather and uniformity of load and speed. I therefore obtained a sufficient number of carriages to form two trains of equal size and weight, and I had a quantity of materials weighed and placed in each of them equivalent to a load of passengers. The coal-burning engine "Canute," was attached to one of the trains, and the coke-burning engine "Vesuvius," to the other. The weight of the train, including engine and tender, drawn by "Canute," was 170 tons, 8cwt., and that drawn by "Vesuvius," 167 tons, 12 cwt.

The trains left London and Southampton within a few minutes of each other, so that there could be no difference between them in respect to weather, but lest either train should run heavier than the other from extra friction in the axle bearings, I took a second trip on the following day with the engines changed from one train to the other. I registered the particulars of each day's trip separately, but taking the average of the two days working, the difference in respect to consumption of fuel will be more readily seen.

	Average speed.	Average consumption of fuel in lbs. per mile.	Load.
"Canute,"	28.40	Coal, 20·36	19 carriages.
"Vesuvius,"	27·23	Coke, 24·37	19 "

Coal reduced to its coke value 13·57, which shows a clear saving of 10·80 lbs. per mile.

I subsequently tested the capabilities of the coal-burning engine "Canute" for making sufficient steam when drawing heavy loads, and as this engine was rather heavier than the coke-burning engine "Vesuvius," I obtained an additional number of carriages, and after they had been weighted, I had twenty-eight of them attached to the "Canute," and twenty-two to the "Vesuvius," making the total weight of the "Canute" train 235 tons 13 cwt., and that of the "Vesuvius" train 189 tons 6 cwt. I was very desirous of testing the capabilities of the coal engine "Canute" for drawing a heavy load up the incline from Southampton to Andover (a distance of 22 miles) without the aid of a pilot engine, and for that purpose I added about 20 tons extra weight to its train beyond its proportionate load.

Early in the morning of December 19th, 1855, we proceeded to Southampton with the two trains, but unfortunately the water pipe attached to the lower part of the boiler in the "Canute" engine gave way, and the leakage therefrom became so great soon after we left Southampton, that we were obliged to pump into the boiler an extra supply of water to compensate for the loss sustained. A reference to the registered account of the trip on that day will show that while the "Vesuvius" (coke) engine evaporated 7·13 lbs. of water by 1 lb. of fuel, the "Canute" (coal) engine evaporated 9·05 lbs. of water by 1 lb. of fuel. The amount of water, therefore, which passed from the tender of the "Canute" engine was greater by 1·92 or nearly 2 lbs. of water per 1 lb. of fuel, than that from the tender of the "Vesuvius," but notwith-

standing that mishap, the "Canute" generated sufficient steam to draw the 28 loaded carriages up the incline without any aid whatever.

The firing, from the same cause, was increased, but the result on the day's work of the two engines was still in favor of the coal-burning engine, as will be seen from the summary, and it is worthy of remark that when the coal is reduced to its coke value, the result is 10·30 ℔s. per mile in favor of the coal-burning engine, "Canute."

I have shown that the saving effected by the coal-burning engines with the ordinary trains, was equal on the average to 8·56 ℔s. of coke per mile, or 10·80 ℔s. of coke per mile when each engine worked under the same circumstances as to weather, &c., with equal loads; now, if the former quantity, viz., 8·56 ℔s. per mile be taken, the saving is equal to 1·348 ℔s. on each trip, or at the rate of 187¾ tons per engine per annum, at six days work in each week; but if the latter quantity, viz., 10·80 ℔s. per mile be taken, the saving is equal to 1·721 ℔s. at each trip, or 239½ tons per engine per annum.

The consumption of coke by the coke-burning engine "Vesuvius" during one of the trips referred to, was 29½ cwt., which, at 31s. 6d. per ton, was equal to £2 6s. 6d., whereas, the consumption of the coal-burning engine "Ironsides," during another of the trips, was 24¾ cwt., which, at 19 s. per ton, was equal to £1 3 s. 6 d., giving a clear saving on the latter per trip, of £1 3 s. In my report to the Directors of the London and South Western Railway Company, I stated that if they had seventy engines in steam per day, and each of them was fitted up for burning coal, and all worked under similar circumstances to the "Ironsides," there would be a daily saving to the Company of £80 10 s., or £483 per week of six days, or £25,116 per annum.

From the result of these interesting and important experiments, I trust I have succeeded in demonstrating the truth of the assertions I made at the meeting to which I have referred, namely, that coal can be used more economically in locomotive engines than coke; that by the use of coal sufficient steam can be generated to supply locomotive engines when working at high velocities and when drawing heavy loads; and, in support of my assertion relating to the capability of coal-burning engines, built in accordance with Mr. Beattie's patent, consuming their own smoke, I have to observe, that a goodly number of them are at work on different lines of railway, and testimonials of their efficiency have very frequently been given.

(To be Continued.)

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*Association for the Prevention of Steam Boiler Explosions.**

At the usual monthly meeting of the committee of management, held on Wednesday, at the office of the secretary, Mr. Henry Whitworth, Corporation street, Manchester, the chief inspector, Mr. H. W. Harman, presented his monthly report, from which the following are extracts:—The following is a statement of our position as regards the number of works and boilers under the inspection of the association,

* From the Lond. Mining Journal, No. 1231.

for the month ending the 18th March, 1859:—530 mills and other works, and 1466 boilers, being an increase since the 22d ult., of 50 mills and other works, and 139 boilers. We have also made 230 visits and examined 667 boilers and 500 engines. Of these, two visits have been special, and one boiler specially examined, also 11 internally, and 27 thoroughly examined: 84 diagrams have been taken from 49 cylinders; 8 diagrams from 4 cylinders have been special. The usual copies, with calculations of power, consumption of fuel, and general recommendations, have been forwarded to proprietors. The number of boilers found to be defective are as under: corrosion, 20, of which 6 were dangerous; fractures, 3; safety-valves overweighted and otherwise out of order, 31; pressure gauges out of order, 20; water gauges out of order, 17; feed apparatus out of order, 5; blow-off cocks out of order, 9, of which 1 was dangerous; deficiency of water, 2; total 107. 10 boilers were without glass gauges; 28 boilers were without blow-off cocks; 3 boilers were without pressure-gauges; 7 safety valves had the spindles passed through stuffing boxes.

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*Stephenson and Alderson.**

I have waited to see whether any one would point out the fallacy of Stephenson's statement (*Athen.* No. 1633, p. 217,) that either iron or ice will bear a weight passing over it at a greater velocity, which it could not bear if it went slower; and that "when it goes quick, the weight in a manner ceases." The very reverse of this is the truth, as was clearly established by the "Iron Commission," which was appointed a few years since, to inquire into the causes of the breaking down of the iron bridge over the Dee. And the principle so established is now universally acted upon throughout our railways; the speed of the trains, upon approaching bridges of any considerable length, whether of iron or wood, is usually slackened to 8, 6, or even 4 miles an hour, according to circumstances; and the same rule, viz., of going slow, and not of going quick, is always observed in passing over an unsound part of an embankment. I was myself present at some very interesting experiments made by this Commission at the iron bridge of the South-Eastern Railway, near Epsom, in the presence of Lord Wrottesley, Sir W. Cubitt, the Astronomer Royal, and several others. Prof. Willis had contrived a very ingenious apparatus, which, fixed to the centre of one of the iron girders, measured and registered the deflection of the bridge at the passing over of any weight. An engine with a heavily-laden tender was then passed over the bridge at speeds varying from 10 to 60 miles an hour, and it was found that the greater the speed the greater was the deflection of the girder. K. A. W.

* From the London Athenæum, Feb. 26, 1859.

AMERICAN PATENTS.

List of American Patents which issued from May 17 to June 7, 1859, (inclusive,) with Exemplifications.

MAY 17.

181. Cotton Pressers; E. H. Adams, Talladega, Alabama.

Claim.—The combination and arrangement of guide rod, toggle levers, connecting rod, lever, and rack lever, all operating in the manner set forth.

182. Surgical Splints; David Ahl, Newville, Pennsylvania.

Claim—A splint, made of the ingredients, and in the manner set forth.

183. Stencil Brush; V. R. Allen, St. Louis, Missouri.

Claim—The mode of making the handle of the brush in two parts, and fastening the two parts by means of a screw, turned on the wedge (which I term a wedge-screw), which is driven through the bristles in the iron band, thereby wedging the bristles in the band, and enabling the main handle to entirely cover the ends of the bristles and band, which prevents the handle and bristles, when in use, from working through the iron band holding the brush together.

184. Cut-off Gear of Steam Engines; E. R. Arnold, Providence, Rhode Island.

Claim—1st, The combination of an adjustable cam or sector, or its equivalent, located on the rock shaft; a stop-block, or its equivalent, and an arm, or its equivalent, attached to the devices which lift the valve—the three so combined operating to regulate the cut-off of the steam, in its passage into the engine, at any desired point of the stroke. 2d, The same combination above specified, for the purpose of working the exhaust valves of a steam engine, by means of the same rock shaft and eccentric motion with which the steam valves are operated.

185. Variable Exhaust of Locomotive Engines; Wm. S. G. Baker, Chicago, Illinois.

Claim—The plug, arranged in combination with the shell, and with the exhaust pipes of a double cylinder steam engine, in such a manner that the exhaust of each cylinder can be varied while both are separate from each other.

[This invention consists in arranging over the exhaust pipe a rotary cylindrical plug, with different sized openings, which are brought to correspond with the openings in the exhaust pipe and with the openings of the pipes leading therefrom to the chimney by means of gear wheels, which are easily operated from the engineer's stand, and the whole is so arranged that the steam from the two cylinders is kept separate until it reaches the chimney, and that the opening of the exhaust pipe for each cylinder is raised separately.]

186. Sewing Machines; Abraham Bartholf, City of New York.

Claim—Applying the said lever to work on a fixed fulcrum, in combination with a friction clamp, which, though it permits the said lever to be moved by and with the needle arm or needle carrier, during a portion of the movement of the latter in either direction, for the purpose of drawing back the thread through the cloth, and completing the stitch, and letting it slack again to form the loop of a succeeding stitch, holds the said lever in a positively stationary condition during the first part of the movement of the said arm or carrier in either direction, and so prevents the thread getting slack till the needle has entered the cloth, and prevents its being drawn up through the cloth till the heel of the shuttle has arrived at the loop. And in combination with the thread-controlling lever, operated by the needle arm or needle carrier, I claim the stationary eye made adjustable relatively to the said lever.

187. Seeding Machines; E. O. Baxter, Foreston, Illinois.

Claim—1st, The clearers formed of the bars, i i, placed on the seed tubes, connected with the bar, I, and operated through the medium of the lever, J, or its equivalent. 2d, The frame fitted to the axle, in connexion with the cams interposed between the axle and the frame, so as to raise the frame when desired, to throw the seed-distributing device out of gear with the driving wheel. 3d, The arrangement of the frame, lever, N, connected with the frame by the rod, and the upright on the draft-pole, for the purpose of regulating the depth of the furrows.

188. Artificial Legs; Douglas Bly, Rochester, New York.

Claim—1st, Curving or deflecting the jointed extremities of the bars, so as to bring their axes of motion back of their line of direction. 2d, The cord and spring acting upon the parts, D and L, in the manner set forth. 3d, I am aware that metallic springs have been employed to similate the functions of the natural muscles; but experience has proved their inadequacy, both as respects the results obtained and their durability. I am also aware that india rubber or elastic cords have been used for the same purpose, and with no better results, and these I do not claim—but I claim the combination of the non-elastic tendon with the india rubber spring, in such a manner that the required effect is derived from the compression and expansion of the material, and not from its elongation and contraction.

189. Sewing Machines; A. H. Boyd, Saco, Maine.

Claim—The employment of lever, I, a shoe and shoe-shaft, spring, plate, and sliding bar, with an under feed-plate, the shoe and the feed-plate having an intermittent, direct, horizontal, reciprocating motion, and the shoe having an intermitting, direct, vertical, reciprocating motion.

190. Apparatus for Cooling Beer; James Boyle, Roxbury, Massachusetts.

Claim—The combination with two or more vessels containing a series of tubes inserted in diaphragm plates, so arranged as to allow communication from the upper part of each vessel to the lower part thereof, and vice-versa, by means of and through the said tubes or pipes, so arranged on either side of the diaphragm as to connect the said vessels alternately at the top and bottom thereof; and of a pump or any suitable device for forcing beer, or any other liquid to be cooled down, through one set of tubes and up the other, while a supply of cold water surrounding said tubes is forced in a direction opposite to that of the liquid contained therein.

191. Drill Stock; M. S. Brooks, Chester, Connecticut.

Claim—The arrangement and combination with a spiral or screw-shaped shaft of a tube, ratchet, and stop within the socket, as described.

192. PLUG FOR BLASTING ROCKS; J. D. Buckley and S. F. Mosher, Schaghticoke, New York.

Claim—The combination of the tapered screw with the expanding metallic plug, having ledges, or other equivalents, to penetrate the rock, and provided with an aperture for the fuse.

193. MACHINERY FOR HARDENING HAT BODIES; George E. Cowperthwaite, Danbury, Connecticut.

Claim—The method of hardening hat bodies by means of a cradle, sustained in an inclined position, and having a tremulous movement. Also, the method of subjecting hat bodies to greater or less pressure during hardening, by inclining the cradle of the hardening machine to a greater or less extent.

194. ROCKING TOY; J. A. Crandall, City of New York.

Claim—The flat-wound springs, pole or bar, elastic string, pin or thumb-screw, or their equivalent, in combination with the box and frame.

195. MACHINE FOR UPSETTING TIRE; C. L. Crowell and Robert Smith, Peoria, Illinois.

Claim—The combination of the lever and the intermediate slide, for the purpose of giving movement to the sliding jaw.

196. DRAWING HEADS FOR SPINNING MACHINES; James E. Crowell, Chelsea, Massachusetts.

Claim—So constructing and gearing the two pairs of drawing rollers, that each pair will draw and release the sliver or roving, and so allow the twist to pass and run back to the first rollers.

197. SOAP; William Dawes, Washington County, Tennessee.

Claim—The use of the ingredients, when combined in the proportions set forth.

198. TUYERE; George W. Dean, Glenn's Falls, New York.

Claim—The adjustable rotating chambered cylinder, arranged with the slot in the bed-plate, and relatively with the blast pipe, to operate as set forth.

199. CULTIVATORS; Oliver H. Dennis, Altona, Illinois.

Claim—The arrangement and combination of the hinged handles, hinged side beams, B B, and connecting bars, in relation to the central beam, A, for the purpose specified.

200. STRAW CUTTERS; J. B. Drake, Goshen, Indiana.

Claim—The arrangement of the hinged, forked, feeding pawl frame, feeding and stop pawls, centrally arranged ratchet wheel, spiked feed roller, and rising and falling knife frame.

201. LAMPS; John L Drake, Cincinnati, Ohio.

Claim—1st, A wick tube for containing two or more flat wicks, one at least of which wicks is a conductor, said tube having a double chamber, brace, and opening, as stated, so that the burning wick may receive the oil from the conductor, and still be free to move upon or against it, as it is raised or lowered, to regulate the burning. 2d, In combination with a slotted and perforated dome, and a flat wick for burning heavy oils, an auxiliary flat wick and wick tube.

202. APPARATUS FOR EVAPORATING SACCHARINE JUICES; Daniel I. Durfey, Croton, Ohio.

Claim—1st, A descending series of evaporating pans, each having a well or depression on the side next its immediate successor in the range, closable by sluices. 2d, The arrangement of the sluices alternately on the right and left of the range, when used in the described combination with the wells or depressions referred to. 3d, The strainer, in the described combination with the clarifier, operating in the manner set forth.

203. WATER INDICATOR FOR STEAM BOILERS; John L. Frisbie, Cincinnati, Ohio.

Claim—1st, The described combination and arrangement of the box, adjustable pipe, valve, sleeve, and sector, operating in connexion with the float arm, for the purpose of varying the point of alarm from the outside of the boiler. 2d, The cogged sector provided with a segmental slot, in combination with the sliding sleeve, float arm, and bolt, to enable the application of the alarm to any part of the boiler.

204. NUT CRACKER; Russel Frisbie, Middletown, Connecticut.

Claim—The nut cracker, substantially as described.

205. WATER-WHEELS; Omri C. and Jarvis O. Ford, Collinsville, Connecticut.

Claim—The application of the reversed curved buckets or guides, to form a reversed action centrepetal and centre vent turbine water-wheel, in combination with the inner and outer cut-off.

206. STRAW CUTTERS; A. W. Fox, Athens, Pennsylvania.

Claim—1st, The arrangement of the wheels, or their equivalent, in connexion with the crank, connecting rod, sliding frame, and shafts, by which I obtain an accelerated upward and retarded downward motion to the knife of a straw cutter. 2d, The combination of the sliding frame, with the knife sliding in the said frame, by means of the action of the angular slot and roller, or their equivalent, by which combination of parts a drawing cut is given to the knife, without interfering with the attachment and operation of the connecting rod, communicating motion from a shaft placed crosswise to the machine.

207. ARRANGEMENT OF KEY-BOARD FOR PIANOS, &c.; Alfred Gould and Cyrus Marsh, Seneca Falls, New York.

Claim—The arrangement of two, three, or more ranges of keys of the key-board, in the manner and in relation to each other, substantially as specified.

208. SEWING MACHINES; Joshua Gray, Medford, Massachusetts.

Claim—1st, The combination of the reciprocating bar with its side inclines and upper incline, with the bar, stop, and adjustable stop, arranged as described. 2d, In combination with the slide bar which operates the feeder, the bent lever, and universally adjustable cam.

209. WEIGHING SCALES; Wm. D. Guseman, Morgantown, Virginia.

Claim—A pendulum drum or roller, which has, in addition to a rolling motion, a traveling movement. Also, in combination with a rolling and traveling drum or roller, and an index, a traveling vernier or dial. Also, the combination of the horizontal levers of a platform scale with the pendulum drums and bands.

210. MACHINE FOR ROASTING COFFEE; Josiah D. Harrington, Rochester, New York.

Claim—1st, The construction and arrangement of the divided handle, whereby the crank not only serves to hold the two halves of the ball together, while rotating, but also to lift up one-half of the ball when moved into the position shown. 2d, My method of uniting the two halves of a coffee-roaster, by means of the hinge formed of the curved jaw attached to one-half of the ball, and passing into a slot in the second jaw, said slot having the pin beneath which the curved jaw passes.

211. MODE OF APPLYING LEVER POWER; Elijah Harris, Princeton, Illinois.

Claim—The use of a weight, a single or double lever, axle, and pivots, acting in combination with the circular plate, ratchet-clicks, and ratchet wheel, in applying lever power to machinery.

212. COTTON PRESS; Joseph Hawthorn, Thomas Co., Georgia.

Claim—The combination of the screw, the tap-block, and the levers, with the packing cases and their followers.

213. SEWING MACHINES; Albert H. Hook, City of New York.

Claim—The combination of the cam, lever, and spring, arranged as set forth.

214. COOKING STOVES; Sherman S. Jewett, Buffalo, New York.

Claim—The bricks, when constructed, arranged, and supported within the stove, for the purposes of an oven, as described.

215. MACHINE FOR MANUFACTURING PICKET FENCING; Wm. W. Johnson, Clarksburgh, Virginia.

Claim—1st, Operating a series of twisters by means of pulleys and cords, arranged so as to give a twist and reverse twist to the wire, in combination with vibrating fingers, hollow shafts, and tension plates, or their equivalents. 2d, The segmental roller, constructed of the pieces, r r′ r″, for the purposes explained.

216. ADJUSTABLE CANOPY FOR RAILROAD CARS; Isaac E. Jones, Cincinnati, Ohio.

Claim—The combination of springs, covers, and hinges, arranged in the manner set forth.

217. CENTRIFUGAL GUN; Wm. Joslin, Cleveland, Ohio.

Claim—1st, Arranging the barrel upon the same shaft with cog-wheel, which is secured near the periphery of the plate, and revolving the barrel around the wheel. 2d, The combination of the bevel and spurr gear wheels with the plate and barrel. 3d, The arrangement of the slide with the barrel and bevel table, for the purpose of elevating the balls to the barrel. 4th, The arrangement of the revolving hopper, bottom plate, and cylinder, for the purpose of conveying the balls down to the barrel.

218. PUMPS; Albert B. Keeley and James S. Beck, Philadelphia, Pennsylvania.

Claim—The combination of a solid or valveless oscillating piston with the peculiar shaped piston chamber, and with the upper and lower valves.

219. BREAST PLATE AND PERSPIRATION SHIELDS; Henry C. Lester, Brooklyn, New York.

Claim—The combination of the arm-pit shields or protectors and breast pads, substantially as described.

220. RAILROAD FROGS; David D. Lewis, Tamaqua, Pennsylvania.

Claim—The steel point dovetailed to the body of the frog, in combination with the tread-plate and the block, when the said tread-plate overlaps and is riveted to the said point, and when the block is of such a tapering or wedge-shaped form that, during the process of riveting it and the tread-plate to the body of the frog, the said block may serve the purpose of driving the point tight up into its socket.

221. VENTILATING HATS; Arthur Maginnis, Philadelphia, Pennsylvania.

Claim—The combination of the perforated hat body, the perforated sweat leather, and the intervening corrugated band, when said band is provided with corrugation upon its two sides, and made plain and smooth on its rear and front.

222. FILTERER AND PURIFIER; Robert A. Maingay, Pottsville, Pennsylvania.

Claim—1st, The combination of the lime water hopper, agitator, turbine, and hogshead. 2d, The combination of the alkali keg, hogsheads, and turbine. 3d, The arrangement and combination of the purifying and filtering hogsheads, filtering tank, turbines, purifier, and alkali kegs or hoppers.

[The mine water of coal regions is found, by analysis, to be strongly impregnated with carbonic acid, sulphuric acid, large quantities of alum, and sulphate of iron. These properties, as may be well known, render it very destructive to steam boilers and other apparatuses used about mines. The object of this invention is to deprive the water of these destructive properties, and at the same time filter it so that it will be useful for mechanical and domestic purposes. The nature of the improvement consists in a peculiar arrangement of a series of purifying and filtering hogsheads, a large filtering tank or reservoir, a series of purifying kegs or hoppers, and a series of turbines.]

223. ANTI-FRICTION SUPPORT FOR THE BACKS OF RUDDERS; Albert H. Manchester, Providence, Rhode Island.

Claim—Supporting the rudder from behind by means of a backer or brace rising from the deck, or attached above it, having rollers in its face, constructed as described.

224. GAS RETORTS; Alfred Marsh, Detroit, Michigan.

Claim—The employment of the secondary lid, for the purposes set forth, when the same is arranged and connected with the feed pipe.

225. COMPOSITION FOR EMERY STICKS AND WHEELS; Thomas J. Mayall, Roxbury, Massachusetts.

Claim—The composition for the manufacture of emery wheels, sticks, and tools, of more or less flexible nature, formed of gutta-percha or india rubber, and sulphur, emery, and olive oil.

226. MACHINE FOR SAWING BEVELED SURFACES; John McDiarmid, Brooklyn, New York.

Claim—The employment of the oscillating frame, in combination with the centre wheel, central flanch, and saw or cutters, constructed in the manner described.

227. METALLIC SEALS; Charles A. McEvoy, Richmond, Virginia.

Claim—The use of a paper label, or its equivalent, in combination with a metallic seal.

228. SEEDING MACHINES; Charles Messenger, Warren, Ohio.

Claim—The lever, b, arm, c, levers e, and spring, in combination with a combined seeding machine and ground roller. Also, the studs, rods, and shaft, in combination with the cams, when used in connexion with the seeding machine and ground roller combined.

229. SCREW EXCAVATOR; Richard Montgomery, City of New York.

Claim—1st, Making the cylinder, which encloses the screw, in a conical form, for the purpose of rendering the ascent and discharge of the earth more free and perfect. 2d, Supporting the cylinder and screw by means of the hinged frame. 3d, Driving the cylinder and screws by means of the gearing, arranged as described. 4th, Supporting and adjusting the front of the excavator by means of the friction ring and chain or rope. 5th, The curved swinging standard or derrick for elevating the front end of the excavator without

unfastening the chain, when desired. 6th, The combination of the cylinder and screw with the swinging frame, derrick, and carriage.

230. Extension Ladder; Joel Moulton, Boston, Massachusetts.

Claim—The improved extension ladder hose carrier, constructed with a series of single ladder bars, connected together and provided with pins or handles, and having not only an extension line and sheaves connected with and arranged in them (the said bars), as explained, but a supporting platform and guide braces, arranged at the upper part of the upper bar. Also, the combination and arrangement of the water conduit or hose pipe director and its guiding lines with the extension ladder.

231. Metal Drills; Jacob Murphy, Half Moon, Pennsylvania.

Claim—The shoulders on the drill, in combination with the braces and pin upon the sliding frame.

232. Machine for Rolling and Measuring Cotton Bagging; Thomas H. Murphy, New Orleans, Louisiana.

Claim—The combination for simultaneously rolling and measuring bagging, consisting of an adjustable guide bar, sliding shaft, fitting into driver, the windlass and cord, adjustable pressure roller, carrying cam, lever, indicating wheel, arm, pawl, and spring.

233. Machines for Husking Corn; Jacob Naeher, North Orange, New Jersey.

Claim—The reciprocating troughs, one or more, provided with pincers, in connexion with the toothed plates or stripping combs, and with or without the retaining plate.

234. Metallic Frames for Window Blinds; Charles Neer, Albany, New York.

Claim—Constructing frames for blinds of sheet metal, bent in a U form, and connected together as specified. Also, the bent or folded strips, provided with holes receiving the ends or tenons of the slats.

235. Mop Handle; H. and J. S. B. Norton, Farmington, Maine.

Claim—Attaching the mop cloth or yarn to the handle and to a slide fitted on the handle.

236. Manufacture of Bricks; Nelson Parmeter, Gardner, Massachusetts.

Claim—A fire-proof brick or lining, composed of the above named ingredients, in the proportions set forth.

237. Signal Door Bolt; Charles Page, West Meriden, Connecticut.

Claim—Passing the pin which moves the bolt through the door, and permanently fixing to the projecting extremity thereof a segmental plate, so as to overlay the fixed symbol plate, and communicate the desired intelligence.

238. Machine for Planing and Shaving Ice; H. D. J. Pratt, Washington City, D. C.

Claim—The machine or implement for cutting or reducing ice to small particles, as described, the same consisting of the arrangement in a hopper of suitable size and shape of rotating cutters, with or without a presser.

239. Cultivators; Asa Preston, Unionville, Ohio.

Claim—The construction of a combined plough cultivator, having the several parts so arranged that they can be easily attached or detached when said plough has the hinged wings, mould-board, bars, and blades, arranged as set forth.

240. Water-wheels; Reuben Rich, Albion, New York.

Claim—Constructing the pen-stock, dadoed joints, and bolts, in combination with gates, and centre scroll plate, and wheel, constructed in the manner specified.

241. Water-wheels; Sylvanus Richardson, Jericho, Vermont.

Claim—The float with hinges, as shown at point marked a, and the spiral or curved form of the lower part of the float, as shown at points marked b, combined with the extension downwards of the case below the scroll case, and with draft tube.

242. Washing Machine; John R. Rogers, Sacramento, Wisconsin.

Claim—The combination in cylinder of the diagonal slats with the two heads of the cylinder, when said heads are provided with holes of such a shape and form that they will collect and force the water in, and empty it at alternate ends of the cylinder, as the direction of its revolutions are changed.

243. Water-wheel; Timothy Rose, Cortlandtville, New York.

Claim—Forming the buckets of four parts, arranged or disposed relatively with each other, the hub, and annular plate, and with a scroll, specifically as described.

[This is an improvement on that class of water-wheels which rotate in a horizontal plane, and are acted upon and propelled both by the impacting and re-acting force of the water as it passes through the wheel.]

244. Cast Iron Grinding Mills; John Russell, Troy, New York.

Claim—1st, The combination of the breaker and internally armed hopper with the upper grinder and lower grinder, for the purpose of feeding into the mill and grinding large substances, such as corn on the cob. 2d, Making the armed portion of the hopper of separate rings provided with internal projections, and arranged and secured together in the mill, as set forth. 3d, Making the lower grinder of separate toothed rings, arranged and secured together upon the supporting plate. 4th, Making the upper grinder of separate toothed rings, arranged and secured together in and to the supporting plate.

245. Seeding Machines; Thomas Short, Danville, Illinois.

Claim—The swinging frame, when provided with a seed-distributing device actuated by a wheel and cutting furrow shares, and fitted within a mounted frame.

246. Refining Iron in the Hearth of a Blast Furnace; Christian Shunk, Canton, Ohio.

Claim—The employment of an auxiliary tuyere pipe within the hearth of the common blast furnace, when charged with molten iron, at such an angle as that the blast of air entering the iron may strike the circular wall of the hearth, as nearly as possible, at a tangent to its circumference, so as to cause the blast of air to pass round in the metal, giving the whole mass in the hearth a spiral motion immediately before the tapping of the furnace for the manufacture of pig iron from the ore.

247. Sewing Machines; James C. Spencer, Phelps, New York.

Claim—The construction of a feeder and needle bar in one piece or connected together, and the combination of the eccentric and pin with the needle bar, by means of the slot.

248. Harvesting Machines; Wm. S. Stetson, Baltimore, Maryland.

Claim—1st, Connecting the finger bar to the frame of the machine by means of the saddle and its support. 2d, In combination with the saddle, the swiveling guide and swiveling lever. 3d, Throwing the cutters in and out of gear by means of a shifting bar.

249. Harvesting Machines; W. S. Stetson and R. F. Maynard, Baltimore, Maryland.

Claim—1st, The double hinge joint at the end of the finger bar, consisting of the hinge shaft, collar, and brace. 2d, The compound connecting rod. 3d, So constructing or forming the upper part of the obtuse angle iron tooth bar and the base of the finger or tooth, that said base shall bear upon two plain faces of the said angle iron, in the manner set forth.

250. Foot Power Machine; Frederick S. Stoddard, Litchfield, Connecticut.

Claim—1st, A two-throw crank, operated by one pitman, in combination with a lever and spring, or their equivalents. 2d, The mode of attaching the spring to the foot-piece to operate on the pitman crank, in connexion with the set-screws for adjusting and reversing the motion.

251. Potato Planter; J. C. Stoddard, Worcester, Massachusetts.

Claim—1st, The combination of the compound cam, hooked lever, and sliding crosshead, with cutter attached. 2d, Arranging the plough-shares and covering shares on parallel rock shafts, so that a lateral and vertical adjustment can be given to the same.

252. Stop-gauge for Weather Boarding, &c.; Worden E. Stoddard, Horicon, New York.

Claim—The use of the bar forming a stop or support for boards and mouldings, and the knob, the spur, and the adjustable slide.

253. Paddle-wheel; John Thompson and M. L. Doty, Carlton, Iowa.

Claim—The buckets of a paddle-wheel, arranged in combination with the segments, the weighted pinions, and the dogs, or their equivalents. And in combination with the above named parts, the arrangement of the spurs, or their equivalents, for the purpose of retaining the buckets in the proper position while the wheel is backing.

254. Propeller; Charles R. M. Wall, City of New York.

Claim—1st, An apron, arranged in such relation to a wheel that it operates to propel a vessel. 2d, The arrangement of the rollers in combination with the apron, whereby the wheel is made to work at any dip. 3d, The springs or their equivalent, arranged in combination with the rollers and with the apron, for the purpose of regulating the strain on the apron.

255. Needle-case and Index; Calvin D. Wheeler, City of New York.

Claim—A needle-case and index combined for sewing machines, whereby the appropriate sizes of the thread and needles to properly work together is always determined.

256. Seeding Cultivators; Nicholas Whitehall, Newtown, Indiana.

Claim—The combination of the stirrups with the notched handles, eye bolts, and hooks, by which I am enabled to raise and secure the plough at any desirable height.

257. Cements for Roofing; J. Carpenter Worth, Little Britain Township, Lancaster Co., Pennsylvania.

Claim—The composition for roofing made up in the manner and of the ingredients proportioned and mixed, as set forth.

258. Pump; John H. Young, St. Louis, Missouri.

Claim—Dividing the pump cylinder into two chambers by the division valve seat plate, with its valves opening upwards, and uniting them by the water way, as described. Also, the puppet valves, connected to, and operating with, the buckets in the two chambers, so that, whilst they move with said buckets, they shall have action independent of them. Also, in combination with the hollow piston and stem passing through it, the causing of the upper valve to close upwards against its bucket.

259. Railroad Switch; Jacob Youngman, Sunbury, Pennsylvania.

Claim—The arrangement of two guards, so that a space exists between them at the point where the cars take an oblique direction to the switch rails, in order to run upon the lower portion of the main track on a frog plate which has stationary frogs and a rail arranged on it.

260. Lock; Orson Billings, La Grange, Ohio, Assignor to self and Morris Traver, Clinton Hollow, New York.

Claim—The combination of the guards or plates arranged relatively with each other and the bolt, to operate as set forth. Also, the spring tops when applied to the guard or plate, and the latter is used in connexion with its fellow guards, for the purpose described.

261. Hand-planing Machine; Tyrannus B. Butterfield, Indianapolis, Assignor to Abijah Taylor and R. Stevenson, Morgan Co., Indiana.

Claim—The combination and arrangement of the frame, knife, feed roller, spring, and screw.

262. Window Sash Supporter; Sumnor Cooper, Windsor, Connecticut, Assignor to self, Thomas Denham, and Joseph W. Briggs, Cleveland, Ohio.

Claim—The combination and employment of the spring pinion pulley, with the rack or perforated plate, tube, or box, pin, key, and latch.

263. Connecting together the Braces of Truss Bridges; L. E. Truesdell, Warren, Massachusetts.

Claim—The method described of constructing and interlocking the diagonal braces.

264. Feeding Device for Planing Machines; C. B. Cottrell, Assignor to self and Nathan Babcock, Westerly, Rhode Island.

Claim—The combination of the anti-friction and feed rollers, applied to the class of planing machines described, and driven from one and the same shaft by gearing, arranged to admit of a separate lateral adjustment of each.

265. Machine for Shaving Staves from the Bolt; Harry H. Evarts, Assignor to self and P. E. Merrihew, Chicago, Illinois.

Claim—1st, The employment or use of the reciprocating saws in connexion with the swinging bolt frames, operated by the wiper wheels, or their equivalents. 2d, The employment or use of the segment racks, connected by the pinions with the right and left screw rods, having jaws placed thereon, for the purpose of dogging and undogging the bolts at the proper time.

266. Valves for Dry Gas Metres; Henry Howson, Assignor to A. Harris and J. W. Harris, Philadelphia, Pennsylvania.

Claim—1st, A pin, or its equivalent, fitted loosely to the valve, and intervening between the valve and the driver. 2d, Constructing the driver in the form of an inverted cup, with driving pins in the inside, said cup being so arranged in respect to the annular flanch of the valve, as to serve the double purpose of maintaining the latter in its proper position, and of preventing the access of tar to the driving pins.

267. Sewing Machines; Warren Millar, Assignor to self and John Nutt, Chicago, Illinois.

Claim—1st, The hook, as described, in combination with an eye-pointed needle and the spool case. 2d, The combination of the flanch and space, or their equivalents, of the spool case. 3d, The sliding supports, or equivalents therefor. 4th, Imparting to the spool case the tripping or rocking motion, to receive the loop of needle thread from the hook, or its equivalent, in the manner described.

268. Corn and Cob Mills; Wm. Sailor, Assignor to self, William S. Boyer, and H. K. Boyer, Philadelphia, Pennsylvania.

Claim—1st, The plates with their saw teeth, when the said plates are secured obliquely on the spindle and adjacent to the burr, and when both the burr and plates are arranged in respect to the shell, as set forth. 2d, Forming the burr in three or more separate pieces, adapted and secured to each other and to the spindle, as specified.

269. Vinegar Cruet or Bottle; George W. and George H. Simmons, Bennington, Assignors to selves and Norman Millington, Shaftsbury, Vermont.

Claim—A bottle, cruet, or other similar vessel, for containing liquids for table, culinary, or household purposes, provided with the tubes, A and B, made and fitted to them in the manner described.

MAY 24.

270. Shoe for Grain Separators; Hiram Aldridge, Michigan City, Indiana.

Claim—The endless incline elevator belt with its lags or cross slats, in combination with the incline sieve or board and incline extension board.

271. Bedstead Fastening; G. W. Baker, Cochranton, Pennsylvania.

Claim—The box, the hook, and the rack, when combined in the manner described.

272. Smut Machines; E. Barnhart, Shippensburg, Pennsylvania.

Claim—The disc arranged with the fluted shell and with the wings, to operate in combination with the fluted cylinder, which is provided with a spout.

273. Surface Condensers; Daniel Barnum, City of New York.

Claim—The method of making yielding joints between the tubes and tube sheets in the condensing water compartments of surface condensers, and of thus compensating the expansions and contractions in the tubes, by the means of leaving a portion of india rubber, or other elastic packing, immediately surrounding each tube free, so that its elasticity can yield longitudinally with the tubes and compensate for their varying lengths, without causing the packing to slip on the metal. Also, the combination of a relief valve with yielding joints (without followers) in the condensing water compartments of surface condensers, for the purpose of preventing the blowing out of the packing, and thus preserving the joints.

274. Hemming Guides for Sewing Machines; Daniel Barnum, Jersey City, New Jersey, and S. G. Tyler, Quincy, Illinois.

Claim—The manner of arranging and constructing a hollow conical U-shaped tube and slot, in combination with a horizontally acting spring plate, or its equivalent, bearing against the slot, and tending to press the edge of the flexible material, when the same is placed within the slot into the tube, and against the lower side of the concave surface thereof, for the purpose of aiding the hand in turning the hem on the underside, and leaving the fair stitch upon the upper or right side of the garment.

275. Cultivators; J. W. and Leonard Batson, Clarksville, Maryland.

Claim—The arrangement of the reversible concave shovel point, H, reversible shovel point, F, and the cutter, with beam and standards, in the manner described.

276. Rig for Vessels; Thomas Bell, City of New York.

Claim—The arrangement and combination of the mast, spar, and revolving forked mast bench, as described.

[The mast of a vessel and its spar or spars are combined in such a manner that the mast turns with the spar or spars, and all the sail spread on the mast is caused to have a similar lifting action on the vessel; the mast is also attached to the vessel in a novel manner.]

277. Spring Bed Bottom; Ezra R. Benton, Cleveland, Ohio.

Claim—The construction of a bed bottom or spring couch, consisting of a series of double springs, the longitudinal pieces, and the transverse slats, either with or without the flexible band, arranged as set forth.

278. Carding Engines; John Boyd, Philadelphia, Pennsylvania.

Claim—The combination of the rollers and scrapers, for stripping the ordinary doffing cylinder of a carding engine, as described.

279. Harvesting Machines; C. R. Brinkerhoff, Batavia, New York.

Claim—1st, The combination of the crank, operated by the main shaft, with the rake and sweep post, to which it is attached, and the eighth arm. 2d, The open work divider to divide the grain falling upon the platform from the gavel being removed therefrom by the rake, when arranged upon the rake-head, in the manner specified. 3d, The spring catch and dog in combination, and the location of said catch, to break the forward motion of the rake and its return by the spring. 4th, The projection on the lower side of the slot or notch in the dog to arrest the catch with certainty. 5th, The application and arrangement of the toothed rack connected with the spring, by which the rake is caught and held after its descent upon the gavel, the rebound thereof is prevented, and the gavel removed with greater certainty. 6th, The placing of a rake (having spring teeth) in the rear of the machine, for the purpose of gleaning and contracting the gavel sheaf into form. 7th, The combination of the cam attached to the main shaft, with the arm of the rear rake, to cause it to pass over the gavels at the proper time. 8th, The ratchet cam and lever in combination, for throwing both rakes into or out of action.

280. APPARATUS FOR HEATING FEED WATER OF STEAM BOILERS; J. T. Brooks, New Albany, Indiana.

Claim—The relative arrangement of the force pump, water supply pipe, heater, and steam pipe, conveying steam from the upper part of the boiler or steam dome to the heater, to heat feed water on its passage between the pump and the boiler, by means of living steam, and inject it into the lower region of the boiler.

281. HARROWS; R. W. Buckles, Grayville, Illinois.

Claim—Two harrows hung to one frame, independent of each other, with two vertical toothed wheels also working independently of each other, and connected to the horizontal wheels, which are actuated by means of pinions.

282. OX-YOKES; Washington Burnham, Essex, Massachusetts.

Claim—The mode of applying the pole ring to the yoke, namely, by means of the staple rack and the ring carrier, made so as to be capable of sliding on the rack, and with a pin passage arranged with respect to the notches of the staple rack, as described.

283. CURTAIN RACK; J. F. Calhoun, Wolcottville, Connecticut.

Claim—The combination of tightening screw, collar, pulley, and button, for effecting the required tension on the cord.

284. SEWING MACHINES; P. S. Carhart, Collamer, New York.

Claim—Feeding the cloth by the combined action of the needle and friction pad, when the said needle and pad operate jointly and in unison to propel the cloth, as the needle descends therethrough, the cloth being held in its required position by the needle during the intervals of feed, while the pad is retreating to take a fresh feeding grip on the cloth.

285. BREAD KNIFE; Joseph Carrier, Marlborough, Connecticut.

Claim—The employment of the roller and the adjustable studs with the collars and thumb-nuts, as described.

286. STOVE PIPES; M. C. Chamberlin, Johnsonburgh, New York.

Claim—1st, The employment of the spring tube in connexion with the pipe, in the manner specified. 2d, The arrangement of pipe, C, provided with pin, with pipe, A, provided with slot, a, and spring tube, in the manner specified.

287. HORSE POWER MACHINES; A. B. Colton, Athens, Georgia.

Claim—1st, The stationary wheel and its hub, when the same are placed centrally with the large driving wheel, for giving motion to the pinions and gear wheels, revolving with the driving wheel, so as to impart a rapid rotary motion to the horizontal shaft, having its bearings in the axes of both driving wheel and stationary wheel. 2d, The sectional yoke, in combination with the annular collar and set-screws.

288. JOINERS' BENCH; J. E. Cryer, Peoria, Illinois.

Claim—1st, The movable jaw, B, arranged with reference to the permanent jaw, b, in such manner as to secure properly the lumber to be wrought, and at the same time to form a track or guide for the plane during the operation of jointing and squaring lumber. 2d, Operating the jaw, F, by means of guides, rod, lever, and dog. 3d, The gauge, adjustable vertically, with reference to the jaws, B b, in combination with the scale.

289. CARPET SWEEPER; Henry Davis, Bethlehem, Connecticut.

Claim—The arrangement of the rollers to operate in combination with the yielding brush and with the scraper.

290. HOMINY MACHINES; Wm. Davis, Middleburg, Maryland.

Claim—Providing the outer cylinder with apertures gauged to such a size, as while serving to discharge the hulls also to perform the additional function of discharging the hominy, as soon as reduced to the desired degree of fineness, in combination with the inner cylinder, when the same is driven at the specific speeds, as described.

291. COMPOSITIONS FOR ROOFING; J. M. Day and E. H. A. Oakley, Aiken, South Carolina.

Claim—The ingredients in the proportions set forth.

292. MILL-STONE BUSH; M. DeCamp, South Bend, Indiana.

Claim—1st, The adjustable followers provided with convex sides and backs fitted within an oil-box, and arranged in relation with the collar of the spindle, to operate as set forth. 2d, The serrated or notched wheels, attached to the outer ends of the screws, when used in connexion with the stops attached to the plates, as specified.

293. CHIMNEY CAPS; Charles Douglas, Hebron, Connecticut.

Claim—1st, The valves, and the manner and the position in which they are suspended. 2d, The arrangement of the neck, the top, and the standards, in combination with the valve, or its equivalent.

294. DRY GAS METRES; Samuel Down, City of New York.

Claim—Constructing or arranging the mouths of the channels of communication between the inlet and outlet pipes, and the measuring chambers and valve chamber of a dry gas metre, to dip down in the wells below the said pipes, as set forth.

295. RAILROAD CAR COUPLINGS; Christian H. Eisenbrandt, Baltimore, Maryland.

Claim—The plates with the springs, the prong-grasping grippers, with the spring latch, constructed as set forth. Also, the hitching pin or bolt, provided with the chain and button or ring, when used in combination with the clasping prong grippers and brake lever, as set forth. Also, the combination and arrangement of the sliding belts with the prong-clasping grippers, as set forth.

296. DEVICE FOR SECURING LIGHTNING RODS; John A. Enggren, Brooklyn, New York.

Claim—An insulator for lightning rods, composed of a glass standard, a spring clasp, having shanks, and shoulders, and otherwise made as described.

297. DEVICE FOR CLAMPING THE BOLTS IN CIRCULAR SAWING SHINGLE MACHINES; Kasson Freeman, Fond du Lac, Wisconsin.

Claim—The arrangement of the sliding or adjustable block with weights attached, or their equivalents, when used in connexion with the sliding jaws.

298. TIES FOR COTTON BALES; Edward Garrett, New Orleans, Louisiana.

Claim—The combination of the two plates, &c., when arranged to form a tie for iron bands for baling cotton, or for similar purposes.

299. Trunk Lock; E. L. Gaylord, Terrysville, Connecticut.

Claim—The arrangement of the bolt with the springs and tumbler, to operate as set forth.

300. Horse Rakes; Elisha Geiger, Lancaster, Pennsylvania.

Claim—The arrangement of the cross-bar, having the flat springs and heads, and provided with arms for actuating the supporting bar with and in relation to the clearing rocker shaft.

301. Cases for Stereoscopic Pictures; Henry Glosser, City of New York.

Claim—1st, The arrangement of two or more pairs of eye-glasses on the same side of a stereoscopic case, so that several persons can look at the pictures at one and the same time. 2d, The picture frames, arranged with cogs, or their equivalent, at their lower edges, in combination with the cams, j j′ j″ j‴, or their equivalents, whereby the same are made to travel from one pair of eye-glasses to the other. 3d, Giving a double motion to the picture frames, first in a direction transversely through the case by the action of the cam, g, or its equivalent, on the endless belt, E; and second, in a longitudinal direction by the action of the cams, j. 4th, The arrangement and combination of the endless belts, E E′, to operate in relation to the channel, G, substantially as described. 5th, The cams, g g‴, arranged in combination with the cams, j j′, &c., or their equivalents, in such manner that they produce the within described motion of the picture frames at alternate intervals.

302. Washing Machine; Arthur Gray, Naples, Maine.

Claim—The improved washing machine, as made with a set of fluted rollers and a fluted presser or bucking-board applied to the reservoir, as described, in order to enable the clothes to be both rolled and beaten during the operation of washing the same.

303. Steam Boilers; Benjamin L. Griffith, Hazel township, Pennsylvania.

Claim—The combination of the single smoke-stack, single chamber, and double series of flues, with the hollow-hinged doors and diaphragms, arranged as set forth.

304. Piano-forte Action; Napoleon J. Haines, City of New York.

Claim—The cross-shaped or four-armed fly, applied in combination with the jack, the key, and the hammer butt, to operate as set forth.

305. Machine for Filing Saws; A. Hadley, Lynn, Massachusetts.

Claim—1st, Determining the bevel of the teeth of a straight saw, by means of pivoting the frame (which supports the rail and saw-plate,) at h, and hinging rods, to said frame, and confining these rods in their relative position by set-screws. 2d, Determining the bevel of the teeth of a circular saw by arranging the shaft of the saw between two points, l and m, one of the points, m, being adjustable by means of a grooved piece, block, and set-screw. 3d, Determining the bevel of the straight and circular saws by combining the frame with grooves, forming arcs of a circle, in combination with clamp screws and slotted plates. 4th, Holding the file by clamps, r″ r″, set-screws, o″ o″, in combination with shaft, n″, set-screw, p″, and bracket, m″, constructed in the manner set forth. 5th, The combination of the movable table with the mechanism for supporting and moving the saws, constructed and arranged thereon as described, whereby the same machine can be quickly adapted for filing either straight or circular saws. 6th, The combination of the mechanism for supporting and moving the saws with the mechanism for supporting and operating the file.

306. Hubs for Carriage Wheels; Luther T. Hazen, Coventry, New York.

Claim—Enclosing wood hubs for carriage wheels, or other vehicles, with metal cases which form the pipe box and bands, in the manner described.

307. Machine for Raising Railroad Truck; Wm. Henney, Wapello, Illinois.

Claim—The balance, arranged with the arms and with the extensions to operate in combination with the piston, the serrated bar, the pawl, and with the eccentric disc, in the manner described.

308. Ovens; John F. Hoffmeister, Alton, Illinois.

Claim—The arrangement of the flues which terminate in the chamber, in combination with the additional flue, to operate in combination with the rotary platform, as specified.

[A rotary platform is arranged over the flues which convey the heat from the fire-place, and the heat is carried by two other flues (uniting into one,) over the platform, so that the dough which is placed on the platform is exposed to a considerable and uniform heat during the first half of its rotation, and to a less heat during the latter half of its rotation, and so a loaf of bread, or other article, is well baked after it has been once rotated on the platform.]

309. Clothes Dryer; C. R. Hurlbut, Yorkshire, New York.

Claim—The arrangement of standards side rails, cross rails, and sash, provided on their under side with buttons, the whole being jointed, and the several parts acting conjointly in the manner specified.

310. Coolers for Beer; Charles Jones, Brooklyn, New York.

Claim—The shell arranged in the cooler, so as to form the two compartments, to operate in combination with the coil, as described.

311. Manufacture of Water-proof Cement Pipes; Alfred Fauvin Jaloureau, Paris, France; patented in France, December 30, 1857.

Claim—The manufacture of air and water-tight tubes or pipes by the process set forth.

312. Separators for Smut Machines; G. P. Jordan, Burlington, Iowa.

Claim—1st, The combination and arrangement of the scourer with the spout, chamber, and box, provided with the blast chambers, spout, H, fan, and screens. 2d, The employment or use of the valves placed in the partition plates, when used in combination with the fan, chamber, spout, D, and scourer, and arranged relatively therewith, as set forth.

313. Churn; William Kelly, Hastings, Michigan.

Claim—The combination of the dashers with the slide partition and connecting rods, the parts being so connected to the frame that the oscillations of the churns shall operate the dashers, and force the cream against and through the slide partition—not intending to claim the operation of the dasher or dashers by the oscillations of the churn, but only the combination and arrangement of the vibrating dashers with the movable partition and concomitant parts, as described.

314. Harvesting Machines; Jesse Little, Chambersburg, Pennsylvania.

Claim—The arrangement of the sliding brace, in combination with the tongue and bar, constructed and operating in the manner described. Also, the combination and arrangement of the caster plate, jaws, and segments, in the manner described.

315. PROPELLING AND STEERING APPARATUS; Murdick Lytho, Alleghany, Pennsylvania.

Claim—1st, The shaft, b, with a supporting arm or arms and bearing recess, in combination with the propeller or paddle-wheel shaft, K, arranged in the manner set forth. 2d, The tubular shaft, c, with gear wheels at the upper and lower ends, in combination with the shaft, b, and propeller shaft, K, arranged in the manner set forth.

316. PROPELLER; Levi H. Markley, Line Lexington, Pennsylvania.

Claim—The arrangement and combination of the peculiarly acting paddle blades or fliers, pivoted frame, rods, hooks, sliding block, and reversing and bracing bar, as described.

317. METHOD OF FORMING PLOUGH HANDLES; George W. Matthews, York, Pennsylvania.

Claim—The arrangement and combination of the carriage provided with the patterns or curved surfaces, the adjustable rotating cutter head, belt, and adjustable shaft, provided with the pinion and the rack attached to carriage.

318. METALLIC PIPE; W. S. Mayo, City of New York.

Claim—The application of longitudinal strips to the surface of a metallic pipe, in combination with the coiled wire covering, whereby I am enabled to insure great strength with a less thickness of metal.

319. BAG FASTENER; Wm. P. Maxson, Albion, Wisconsin.

Claim—The employment of the oblong grooved faced plate, or its equivalent, having two segments of its middle portion punched out, so as to admit the string and fasten it to the bag, in combination with the string and ring, when constructed to operate upon the principle of the wedge.

320. EGG-BEATER; Thomas McBean, Fowlerville, New York.

Claim—The double spiral dasher, in combination with a square box, where the same are arranged substantially as specified.

321. SEED PLANTERS; John McKown, Geardstown, Virginia.

Claim—The arrangement for united operation of the horizontally-moving hand lever, vertical shaft, horizontal elbow lever, horizontal slides, divided hopper, seed tube, and vacuum plate, as set forth.

322. SEATS AND COUCHES FOR SLEEPING CARS; Thomas E. McNeil, Philadelphia, Pennsylvania.

Claim—1st, Two adjacent seats, each seat having detachable cushioned boards, G and E, and each having a permanent end frame and a rear frame, with upper and lower ledges, in combination with the swing bracket and rib, or their equivalents, arranged so that the cushioned boards, G, of the two adjacent seats may form one couch, and the boards, E, of the same seats another couch, and so that when the said boards are arranged as couches there may be a space between them and the permanent end frames. 2d, Constructing and arranging the end frames of four seats, so that they may serve as supports for the cushioned platforms, which form the two intermediate berths.

323. ATTACHING THILLS TO AXLES; John Miller, Bucyrus, Ohio.

Claim—The adjusting and securing the hook on the pin, by means of the circular face on the jaws, and the shoulders on the iron.

324. THRESHING MACHINES; John R. Moffit, Piqua, Ohio.

Claim—The described arrangement of fixed bearings, set-screws (in the line of adjustment), and hinged concave heads, the whole operating together to set and rigidly retain the toothed portion of the concave at any desired proximity to the threshing cylinder, while at the side at which the unthreshed grain enters, its distance is substantially unchanged.

325. MACHINE FOR DRESSING KID SKINS; Timothy Newhall, Lynn, Massachusetts.

Claim—The rotary brush, in connexion with the reciprocating bed or carriage connected with its guide rods by springs, the parts being arranged to operate as set forth.

326. SMUT MACHINES; T. A. Noble and Erastus Coy, Akron, Ohio, and James B Angell, Alleghany, Penna.

Claim—1st, The adjustable hoop, in connexion with the increased chamber, f to regulate the blast passing up through the circular opening, N, also the adjustable ring, D, to regulate the blast coming up through the circular opening E; the operation in both cases being to increase or diminish the blast, as may be required. 2d, The chamber, G, in combination with arm, F, and spout, L, when said chamber is placed above the revolving chamber, H, to catch the screenings. 3d, The revolving chamber, H, provided with sides and rim, for distributing the wheat evenly as it falls over the edge of the rim, so as to be more effectually operated upon by the blast passing up the opening, E, and also the flanch, M, upon cylinder, L, for the similar distribution of the wheat to the second blast rising through opening, N. 4th, Making the conical scourer adjustable perpendicularly, both independently of shaft, A, and disc, L, and in connexion with said shaft and disc.

327. MACHINES FOR CUTTING SOLES; John S. Shattuck, Malden, Massachusetts.

Claim—The alternating or vibrating segment carrying the two cutters, having the toe and heel in opposite directions. Also, the yielding table which supports the leather as it is fed forward, and the yielding gauge by which the leather is brought to the right position to be operated upon by the cutters. Also, the projecting knife-edge at the heel and toe of the cutter, by which the scraps are detached from the strip of leather.

328. FOLDING CRADLE; L. K. Selden, Haddam, Connecticut.

Claim—1st, The rockers of a cradle arranged with slats, or their equivalents, and operating in combination with the bottom braces, the upright cross-bars, the longitudinal bars, and the top bars, in the manner specified. 2d, The arrangement of the slides, in combination with the bottom braces, and with the upright cross-bars, to operate as described.

329. STRAW CUTTERS; George Roushe, Lima, Ohio.

Claim—The relative arrangement for united operation in a straw cutter of the reciprocating cutting knife, when arranged in a circularly-moving frame, reciprocating feeding rake, and rising and falling pivoted press-board.

330. PLATFORM SCALES; Elnathan Sampson, St. Johnsbury, Vermont.

Claim—Attaching the rails of the platform direct to the sleepers, which are connected at each end by links to yokes fitted on levers, the lower ends of said levers, at each side of the platform, being connected together and to the shaft of the scale beam by rods. Also the employment or use of the adjustable rods attached to the levers, to permit of the compensation of the same, for the purpose specified.

331. BUCKLES; Adolph Roesler, Warsaw, Illinois.

Claim—The tug-plates, the trace-plate, having one or more knobs, the fork-shaped hame hook, and screw-rod, all arranged as described.

332. CAR COUPLINGS; Richard Rickkon, Rochester, New York.

Claim—Constructing self-adjusting car couplings with a series of grooves, so so as to admit of the coupling (with self-couplers) of cars of unequal heights.

333. BURNERS FOR VAPOR LAMPS; Robert Ramsey, Philadelphia, Pennsylvania.

Claim—The combination of the wick tube, the gas chamber, the tube, and jet, arranged as described.

334. STOVES; Richard B. Pullan, Cincinnati, Ohio.

Claim—A rotating vessel provided with two grates, and a central row of grate-bars, arranged within stoves in such manner as to form two fire chambers, one above the other, and which may be used alternately.

335. MACHINE FOR STRIPPING AND CUTTING SUGAR CANE FOR GRINDING; Luther E. Porter, Lake Mills, Wis.

Claim—1st, The divided clasp, arranged as described. 2d, In combination with the above, I claim the spring cutters, arranged as described.

336. METALLIC SHIELDS FOR BOOTS AND SHOES; Jonah Platt and Myron D. Brooks, Akron, Ohio.

Claim—The construction of boot and shoe shields having an opening in front to prevent water or sand from being entrapped between the shield and the leather.

337. SEATS FOR CHURCHES, SCHOOLS, &c.; Charles Perley, City of New York.

Claim—The combination of the swinging bracket with the turning seat, connected and acting in the manner spec fied.

338. CHUCK FOR SCREW-CUTTING; Richard Nuttall and John Kirkpatrick, Alleghany, Pennsylvania.

Claim—1st, The ring having a portion of the inside cut away or recessed for the purpose of making room for the outer end of the cutting dies. said ring being furnished with cams on the inside, and with a spring catch, lever, cam, and locking stud on the outside. 2d, The cam chamber in the die-box, when used in connexion with the cams and ring. 3d, The regulating stud when made in three parts, and used in connexion with the die-box, ring, and spring catch. 4th, The combination and arrangement of the die-box, cutting dies, and cap, with the ring, the whole being arranged as described. 5th, The eccentric lever on the face-plate, when used in combination with the lever, cam, locking stud, and spring catch, as described.

339. MACHINE FOR CUTTING SCREWS; Richard Nuttall and John Kirkpatrick, Alleghany, Pennsylvania.

Claim—1st, The combination and arrangement of the levers, rods, stops, and springs, with the holding or sliding head and eccentric lever, in the manner described. 2d, The use of the sliding or holding head and eccentric lever, when used for the purpose of opening and closing cutting dies in chucks for screw-cutting.

340. SPRING BALANCE FOR WINDOW SASH; F. H. Smith, Plainville, Connecticut.

Claim—The manner of securing the pulleys in the head jamb of the window frame, and the manner of winding up and adjusting the two pulleys through one orifice.

341. COAL SCREEN; Jasper Snell and John R. Deihm, Pottsville, Pennsylvania.

Claim—The arrangement of the plates or blades in parallel planes with spaces between their edges, so as to slope lengthwise of the screen and crosswise from the centre of the screen.

342. FRICTION PULLEYS; Edward Spalding, Wesborough, Massachusetts.

Claim—The combination of the tubular rest with the driving pulley, the hanger, or its equivalent, and the shaft of the driving pulley, the pulleys being arranged and made to operate with respect to one another, as specified.

343. SAILS FOR FORE-AND-AFT RIGGED VESSELS; A. Washington Stewart, Cambridge, Maryland.

Claim—In fore-sails the clue-sail, of the form specified, united to the after-leach of the fore-sail, and managed by sheets, as set forth.

344. SEED PLANTERS; Stephen L. Stockstill, Medway, Ohio.

Claim—The described arrangement of the open notches, pivot, drag-bar, and pin, constructed in the manner set forth.

345. MECHANISM FOR VARYING SPEED; James A. Stoddard, Milford, Massachusetts.

Claim—Graduating or varying speed by means of pulleys, or their equivalents, operated in connexion with surface wheels, or their equivalents, in such manner as to receive and transmit the motion at variable distances from their centres, when constructed and operating substantially in the manner set forth.

346. PORTABLE WAGON JACKS; Henry Stowell and Lorenzo Spencer, Placierville, California.

Claim—The peculiar arrangement, combination, and adaptation for the purpose of raising the axles of wagons, and other heavy bodies, to which the foregoing invention may be adapted.

347. WEIGHING SCALES; Francis M. Strong and Thomas Ross, Brandon, Vermont.

Claim—The employment of an auxiliary frame, in combination with, and interposed between, the platform and levers. Also, constructing such intermediate frame in two parts, connected by movable joints at the angles. Also, the manner of constructing and inserting the bearing blocks that rest on the knife edges. Also, bringing the ends of the arms immediately one above the other, in combination with the mode of connecting the two with the beam by single and double connecting rods, substantially as described.

348. PLATFORM SCALES; Francis M. Strong and Thomas Ross, Brandon, Vermont.

Claim—Arranging the series of rocking levers which sustain the platform, with their shafts all parallel, and with the arms of all of them in the same line, except those constituting the inner section, which are inclined, in combination with the transmitting lever above, which connects with the scale beam, to the short arms of which they are all suspended at equal distances from the axis of vibration. Also, the method of connecting the several sections of the shaft of the transmitting lever, by means of projections and links, for the purpose of enabling it to yield freely to inequalities or variations in the supports, that it may vibrate freely and without binding, and thereby transmit the weight accurately to the scale beam, as described. Also, suspending the bearing blocks by two links, in manner substantially as described, so that any swinging motion of the levers will not cause the blocks to vibrate on the knife-edges, by which means we are enabled the better to preserve fine knife edges, so essential to accurate weighing. Also, constructing the bearing pieces with convex face and projecting tenon, whereby they are rendered self-adjusting, that the knife edges may bear without binding. Also in combination with the nose-iron, adjustable by a screw in the end of the transmitting lever, the employment of a spring bearing against the end of the adjusting screws.

349. MACHINE FOR CUTTING IRREGULAR FORMS; Isaac T. Tice, Baltimore, Maryland.

Claim—The employment or use of the vibrating bed with fence or gauge and feed or pressure rollers, attached in connexion with the rotary cutter head fitted in stationary bearings on the platform or table, the whole being arranged as set forth.

350. SUGAR CANE HARVESTERS; Robert R. Taylor, Reading, Pennsylvania.

Claim—The two sets of rotating cutters, one set being situated above and in advance of the other set, in combination with the reel and shield, as set forth.

351. MACHINE FOR CUTTING SOLES; John Thompson, Marblehead, Massachusetts.

Claim—The arrangement and application of entire sole-cutters (viz: such as are capable of cutting out an entire sole, finished on its sides, toe, and heel,) on opposite sides of a rotary shaft, so that after each semi-revolution of such shaft, and during each descent of it, an entire sole, with heel and toe complete, may be cut from the piece of the leather by one of such sole-cutters acting thereon, and while the piece of leather is supported on the bed or block under such shaft. Also, the application of the catch and cams to the pinion, and a spring slider applied to the shaft, and so as to operate therewith, as specified. Also, in connexion with the entire sole-cutters applied to opposite sides of the shaft, and operated as described, a gauge, and mechanism to operate it in such manner as first to move it up to the path of the cutter, and carry it away therefrom sufficiently to enable the sole that may have been cut to be discharged from the supporting bed.

352. ROCKING CHAIR; Thomas H. Tatlow, Jr., Palmyra, Missouri.

Claim—A rocking chair, having its arms extended down to the rockers, and its back arranged and operated as specified

[This invention consists in extending the arms of the chair down behind the seat to the rockers, so as to form a circular arc, the under edge of which is provided with saw teeth, which serve to retain the back in any desired inclination, by means of a rod with two rectangular bends at each end, which rod is attached to the back, and the bends of which are forced into the saw-teeth attached to the extension of these arms, by means of springs.]

353. REEFING FORE AND AFT SAILS; James L. Townsend, Newburyport, Massachusetts.

Claim—The application of the gaff to the mast, so as to be capable of being dropped downward, on either side of the sail, into or about into parallelism with the mast, as specified, in combination with the application of one or two head reefing lines to the gaff and the sail, so as to enable the slack of the leach and upper part of the sail to be taken up, and also the lower end of the gaff to be secured, in order to effect the reefing of the sail. Also, in combination with the said means of reefing the head and producing the lap of the sail, one or more buntlines or lap-securing lines, applied to the leach and the body of the sail, as described.

354. MOULDING MACHINE; Chapman Warner, City of New York.

Claim—1st, The method of packing the sand by dropping it from any given height. 2d, The mode of obtaining the same result by means of revolving bladed shafts, as described. 3d, The double-hinged flask, constructed and secured by plates and pins, as described 4th, The table, constructed substantially as described, under and independent of the moulding board, capable only of a vertical motion communicated to it by the arrangement described, or any one equivalent thereto, and working in connexion with the moulding board, through which latter the patterns, which are fastened on the table, protrude. 5th, The mode of supporting the moulding board from beneath and through the table. 6th, The combination of apparatus for packing the sand with the mode of hinging and securing the flask by plates and pins, and with the vertically working table apparatus for withdrawing the patterns from the sand through the moulding board, supported as described.

355. RING TRAVELER SPINNING FRAME; Joseph W. Wattles, Canton, Massachusetts.

Claim—The improved arrangement of the ring flanches by which the traveler is supported, and on which it slides, the same consisting in arranging them with reference to the ring or its axis, substantially as shown.

356. HARVESTING MACHINES; Jesse Whitehead, Manchester, Virginia.

Claim—1st, The supplemental discharging rake arranged with its actuating mechanism, as described, so as to operate automatically and conjointly with the platform rake. 2d, Attaching or suspending the rake-head to the shaft, by means of the pulley, d, rod, oblique bars, and pulley, h, as described, whereby the head is allowed to vibrate, and is perfectly guided or retained on the shaft.

[Letters Patent were granted to this inventor on December 2, 1856, for an automatic raking attachment, on which this is an improvement.]

357. CULTIVATORS; W. I. Wilson, Franklin, Indiana.

Claim—The arrangement of axles, wheels, levers, shanks, ploughs, cross-pieces, guides, and arms, for operating conjointly in the manner set forth.

358. SAW FILER; Solon Wood, White Pine, Pennsylvania.

Claim—The arrangement of the cutters on an arbor, the bearings of which are so arranged that the cutters are subjected to the action of adjustable spiral springs, or their equivalents, in the manner specified. Also, the additional arm which is hinged to the bar, in combination with the sliding pieces, for the purpose of allowing the cutters to follow the action of the springs in two directions, as described.

359. GONG OR BELL FOR SIGNALS; Isaac F. Woodward, Philadelphia, Pennsylvania.

Claim—The escapement bar, constructed as described, in combination with the end and pin of the hammer or striking arm.

360. MACHINES FOR MAKING CLAY PIPES; Henry Aregood, Mansfield Township, New Jersey, and Stephen Ustick, Philadelphia, Pennsylvania, Assignors to John L. Macknight, Bordentown, New Jersey.

Claim—1st, The annular ring upon the core pin (which is also provided with a foot), in combination with a flanch upon the inside of the outer front end of the mould, to retain the core pin in place while forming the bell end of the pipe, operated in the manner specified. 2d, The cam wheel, in combination with the piston, trough, and its connexions, mould, and core pin, for making the bell end and straight part of the pipe at one operation. 3d, The combination of the rock shafts with the two halves of the mould, the former being operated by the cam wheel and shaft, for the purposes described. 4th, The slide, rod, and cam strip, as described. 5th, The arrangement and combination of the cam, rock shaft, and levers, for operating the knife, in the manner specified.

361. WRENCH; Henry J. Behrens, Assignor to Charles S. Pomeroy, City of New York.

Claim—Providing the socket of the screw with a pivot or hinge, substantially in the manner specified.

362. CARPET SWEEPER; Wm. G. Budlong, Assignor to Hamilton W. Conklin and James W. Corning, Hartford, Connecticut.

Claim—In combination with the gear wheel and pinion at either end of the case, the lever, and screw, by which the height of the brush is adjusted and the pinion is engaged with the driving gear.

363. BURGLARS' ALARM; John G. Clark, Assignor to self and Samuel W. Hatch, Augusta, Georgia.

Claim—1st, The employment of one or more cap nipples on a suspended gravitating breech piece or plate, to receive a percussion cap or caps, when said breech piece forms part of a burglars' alarm. 2d, Providing said suspended breech piece or plate with a vertical stem, and arranging to slide over said stem a tubular weight, so that when the alarm detaches from the door and strikes the floor, the percussion force of the breech piece and weight will explode the cap or caps and produce the desired alarm. 3d, Arranging the spring on the stem of the breech piece, between the breech piece and weight, so that the same shall be held far enough apart to allow the necessary movement of the same toward each other to explode the cap or caps when the alarm strikes the floor. 4th, Providing serrations on the under side of the suspending bracket, so that said bracket shall move with the door until it clears the framing.

[This is a little device to be carried in the pocket by travelers. On going to bed it is attached to the door by pushing a bracket in between its upper edge and the upper part of the frame. From the bracket the alarm is suspended by means of a chain above the floor. When the door is opened the bracket detaches and the alarm falls to the floor. The concussion of the breech piece, which carries percussion caps, with a descending weight explodes the caps and produces an alarm, thereby warning the sleeper of the approach of burglars.]

364. APPARATUS FOR COOKING BY STEAM; H. W. Horton, Wheaton, Assignor to Oliver H. Horton, Chicago, and Roswell E. Adams, Wheaton, Illinois.

Claim—The described arrangement of a steam boiler, in combination with a steam chamber, which communicates with a boiler by means of a slide, or its equivalent, and one end of which contains the oven.

[This invention consists in arranging over a closed space formed in the lower part of a box with a flat bottom, a steam chamber, which communicates with the boiler by means of a slide which can be operated from the outside, and part of which forms a separate compartment or oven smaller than the chamber, so that when the chamber is filled with steam the oven will be surrounded by it, except where the door is, the whole being so arranged as to cook articles in the steam or in dry air, and that the oven serves for baking.]

365. HOSE COUPLING; N. N. McLeod, Assignor to Carroll E. Gray, St. Louis, Missouri.

Claim—Making the lip around the conical end, so as to leave a cavity to receive the end of the pipe and the screw nut, when the said lip is a part and portion of the same piece that the cone is, as described.

366. WATER-PROOF SOLE; John W. Smith, Washington City, D. C., Assignor to self and Walter W. Perry, Baltimore, Maryland.

Claim—As a new article of manufacture, the water-proof inside sole, when constructed of the compound above described, placed between two sheets of paper, in the manner set forth.

367. SPLINT BROOM; John W. Wheeler, Assignor to Alden B. Stockwell, Cleveland, Ohio.

Claim—The formation of brooms composed of separate wrought splints, when constructed in the manner described.

368. MACHINES FOR CHANNELING AND EDGING SOLES OF BOOTS AND SHOES; Martin Wesson, Assignor to self and D. B. Wesson, Springfield, Massachusetts.

Claim—1st, The combination of the feed rolls, adjustable knives, and the guide, when constructed substantially in the manner set forth. 2d, The combination of lever, sliding pieces, and knives, when arranged as described, and forming a knife-holding arrangement.

369. CIRCULAR CLAMPS FOR SEWING MACHINES; Stephen G. Tyler, Assignor to self, G. J. Saage, and J. W. Barnum, Quincy, Illinois.

Claim—The combination of a central disc with the convex clamping disc and the flat sustaining disc, for the purpose of dividing the crown and quarters of circular sewing, and presenting the edge of the fabric to the needle, in the manner set forth.

MAY 31.

370. SPRINGS FOR RAILROAD CARS; George M. Alsop, Philadelphia, Pennsylvania.

Claim—1st, The method or arrangement of inclosing an air-tight vessel filled with air in a box or chamber, with a flexible water-proof cover or diaphragm, and surrounding the air vessel with water, or some other suitable fluid. 2d, The arrangement of the convex steel plates which are divided into radiating leaves or segments, connected together at the centre, whose outer edges or peripheries rest upon and slide on the metal ring or plate, and in the recess in the bottom of the top, the whole being arranged for the purpose of forming a flexible metallic support or covering to the diaphragm, to prevent its being strained or ruptured. 3d, The combination and arrangement of the piston, its elastic cushion, the flexible steel plate or plates, metal plate or rings, and the diaphragm, arranged as described.

371. SEED PLANTERS; C. F. Anderson, Charlestown, New Hampshire.

Claim—The ratchet-shaped projections in the hub of wheel, and on the disc of the tube, in connexion with the tube provided with the spiral and straight grooves in which the projection of the tube is fitted—the tube having the side lever attached, and also the catch, the whole being arranged as set forth.

372. STRAW CUTTERS; Ensign Baker, Fredonia, New York.

Claim—1st, The employment or use of the leger knife, provided with the hook, actuated by the cam, and used in connexion with the knives attached to the wheel, and provided with the hooks. 2d, The arrangement of the crank spring with rack attached, and the ratchet on the shaft of the feed roller to feed the stuff intermittently to the knives, as described.

373. TOBACCO PRESSES; John A. Bawsel, Powhattan Court House, Virginia.

Claim—1st, The use of the follower fitting into the groove of the opposite roller. 2d, The springs, as constructed and operated for guiding the tobacco and straightening the leaves as they pass between the rollers. 3d, The use of the treadle, in combination with the springs and with the rollers for separating the springs, and also for separating the rollers, as set forth. 4th, The oil cup and roller in connexion with groove, for oiling the groove and the tobacco.

374. ELEVATORS FOR HOISTING GOODS IN WAREHOUSES; Albert Betteley, Boston, Massachusetts.

Claim—So arranging and combining a rider with a brake, by the means described, or their equivalents

as to operate on a drive-pulley to check or prevent its rotation whenever the driving belt breaks or is removed.

375. Freight Cars; Joseph D. Billings, Rutland, Vermont.

Claim—Placing a metal shoe, single or continuous, between the studs or sheathing boards and sills of railroad cars, for excluding the water, and thereby preventing the rapid decay of the same.

376. Wrench; John W. Brewster, Stamford, New York.

Claim—A wrench having a six-sided handle, stationary jaw, and sliding jaw, with apertures of the precise form shown.

377. Machine for Punching Metal; Jay H. Brown, Grand Ledge, Michigan.

Claim—The application and use of the bars, in combination with lever, punching bar, frusto-conical rollers, rod, and spiral (or equivalent) spring, for the purposes specified.

378. Pump Gearing; John P. Carr, Mattapoisett, Massachusetts.

Claim—The device, as set forth and described, for operating pumps on board of ships, and in other places where said invention may be useful.

379. Stoves; Frederick Bucher, Columbia, Pennsylvania.

Claim—In combination with the fire cylinder, the double radiators, each inclosing an interior chamber and register, so that the draft may be direct or checked at pleasure in its passage through the stove, by which means I obtain much radiating surface and economize much fuel.

380. Joiners' Clamp; John Clackson, Milford, Pennsylvania.

Claim—The clamp formed of the bar, with the jaws arranged and fitted on it, substantially as described.

381. Composition for Pencils; E. P. Clark, Holyoke, Massachusetts.

Claim—The composition for pencils for indelible writing, made by combining nitrate of silver with the several other ingredients herein specified.

[The marking inks so commonly used for marking linen, or other fabrics, are inconvenient and troublesome, each bottle being accompanied by a number of "directions," which considerably bother the brains of housekeepers. This pencil will prevent all this, as all the preparation necessary is the damping of the fabric which is to be marked, when the pencil, which is composed of nitrate of silver, nitric acid, glue, lampblack, and sugar, will leave an indelible mark thereupon.]

382. Machine for Grinding Saws; William Clemson, East Woburn, Massachusetts.

Claim—The elliptical bearings, lever, and double gearing, in combination with the adjustable bearing plates, arranged as specified.

383. Churn; Jacob Closs, Decatur, Indiana.

Claim—The use of the screw dashers, constructed as set forth, in connexion with the wings.

384. Corn Crushers; T. B. Coursey, Frederica, Delaware.

Claim—The employment or use of the serrated flanches placed obliquely and eccentrically on the shaft, in combination with the crushing heads and shell.

385. Gas Regulators; E. Hall Covell, City of New York.

Claim—1st, The combining of the rotary pump or air-forcer with the air receiver and its fluid valve arrangements, in the manner set forth, whereby the one controls the action of the other, and through their joint action the charging apparatus is controlled. 2d, Connecting the commingling chamber of the charging apparatus with the air receiver, for the purpose set forth.

386. Hydro-carbon Vapor Apparatus; E. Hall Covell, City of New York.

Claim—1st, Constructing the apparatus, for the purposes set forth, of detachable parts or chambers. 2d, The arrangement of the feed pipes or tubes and outlet pipes, whereby I am enabled to pass in the material to any one of the chambers, or to let out material, and to examine the interior while the apparatus is in operation, and the process of charging going on.

387. Railroad Car Trucks; G. F. Decker, Scranton, Pennsylvania.

Claim—The axles, of a truck, in separate or independent frames, attached to the bed-piece, and connected by a spring or flexible plate, and used in connexion with the spring.

388. Hand Lever; Edward J. Durant, Lebanon, New Hampshire.

Claim—Combining the forked shaft with the sliding head-piece, the intermediate lever, and the hand lever, in such a manner as to form a compound leverage car-mover, that can be operated as set forth.

389. Cultivators; Celestin Eastburn, Spencer County, Kentucky.

Claim—The arrangement of the ploughs, wheel, block, spring, and rake, as set forth.

390. Machinery for Crushing and Mixing Sugar; Fred. Ebelin, City of New York.

Claim—1st, The reciprocating plunger acting on the sugar-loaf, in combination with the revolving cutter-head, in the manner specified. 2d, The support and latch, actuated as set forth, and acting to drop one loaf of sugar at a time from the hopper, so as to be pressed forward by the plunger. 3d, The sliding bar fitted with the incline, in combination with the pins on the wheel, and the weight, or its equivalent, for drawing back the plungers, in the manner specified. 4th, The revolving mixers, constructed with slats between the heads, in the manner set forth.

391. Machines for Drying Fibrous Substances; Jeremiah Essex, North Bennington, Vermont.

Claim—The manner herein specified of guiding an ascending and descending endless apron by the pulley, or their equivalents, acting on the edges of said endless apron.

392. Looms for Weaving Plaids, &c.; Merrill A. Furbush and George Compton, Worcester, Massachusetts.

Claim—The employment of two sets of ratchet wheels and appendages, each set consisting of reversed ratchets, in combination with two sets of cams and two series of shuttle-boxes. Also, two sets of reversible ratchets and appendages, the two sets of cams, and two series of shuttle-boxes, in combination with one pattern chain or cylinder, in manner specified.

393. Washing Machine; George Geer, Uniontown, Illinois.

Claim—A washing machine provided with a lever, cylinder of rollers, clutch, endless belt, adjustable levers, made as set forth, so that by shifting the lever the motion of the belt will cease, and hold the clothes

at rest beneath the rotating cylinder of rollers, and so that the belt may be loosened or tightened when desired, by shifting the levers.

394. Tanning Leather; Jacob Gove, Milford, New Hampshire.

Claim—Giving to the liquor or tanning fluid in the vat a rapid motion, commencing across the bottom of the vat and under the suspended hides, for the purpose set forth.

395. Construction of Pins for Securing Artificial Teeth; John Hassell, Jr., Newark, New Jersey.

Claim—The splint-pin, used double or single, half round or flat, for the purposes set forth.

396. Meat Cutter; Henry Havell, Newark, New Jersey.

Claim—1st, The hook-pointed rotary knives, arranged in the described relation to the hopper. 2d, The combined arrangement of the stationary curved knives, latitudinal grooves, and rotary knives, as set forth.

397. Retorts for Distilling Coal Oils; Robert W. Hazlett and John H. Hobbs, Wheeling, Virginia.

Claim—1st, Constructing the horizontal retort with a pan or flat-shaped base and inclined upper sides or top, and with open conduits or gutters running from end to end of the retort, and arranged on the inner sides thereof, and set inclining and emptying into the neck of the retort, the whole for united operation, as set forth. 2d, The drawer or charger when open at top, and in no way or at any time attached as a fixture to the retort, and yet serving during the distilling process as a part of the generating chamber, and being kept elevated above the bottom of the generating chamber, and allowed to slide in and out without the necessity of removing or disconnecting any portions of the retort or generator.

398. Retorts for Distilling Oil from Coal; J. E. Holmes, Newark, Ohio.

Claim—The employment in a retort for distilling oil from coal, of a central perforated tube, suspended from the mouth-piece, an open space being also left below the bottom of tube, for the removal of the coke residuum through the mouth.

[This improvement consists in the employment, within an upright retort, and at or near the centre thereof, of a perforated tube, through which the vapors, or a great portion of them, can escape to the exit pipe as fast as they are eliminated, without being drawn or forced into contact with the heated sides of the retort, as the greater portion of the vapors are caused to do in the ordinary stationary retort, by the packing of the coal in the centre of it.]

399. Wheel Jack for Carriages, &c.; Henry Hooton, Massachusetts, and J. G. Bicknell, Cambridgeport, Massachusetts.

Claim—1st, The combination of the hollow box with the lever, the front jointed pawl, the back pawl, and the notched shaft. 2d, The combination of the button, E, the spring, the catch, the button, H, and the jointed connecting rod, as described.

400. Door Latch; Mark Howland, Waterbury, Connecticut.

Claim—The specified relative arrangement for united operation of the latch, with female screw-threaded socket, latch guide plate, with square opening, latch shank or rod, with male screw-thread on its front end, stationary slotted guide case, shoulder on the latch shank or rod, spiral spring, sliding connecting link or plate, with cross-heads and double-acting knob-tumbler.

401. Mode of Securing Corks in Bottles; Robert W. Huston, Calais, Maine.

Claim—The metallic pieces which are hinged on a wire secured below the enlargement on the bottle neck, and which are provided with teeth with the strips, and with the wire and clasps, arranged in the manner specified.

402. Sewing Machines; A. B. Irving, Terre Haute, Indiana.

Claim—The arrangement relatively to one another of the following parts, to wit: the upper and lower feeding arms, upper and lower rack shafts, actuating cam, combining and regulating projection, and slotted adjustable spring holding down bar, for the purposes set forth.

403. Retorts for Distilling Oil from Coal; Wm. G. W. Jaeger, Baltimore, Maryland.

Claim—1st, The side channels and the trap openings or discharge pipes for the heavy oils. 2d, In combination with said side channels, the double inclination or arched form of the bottom of the retort. 3d, In combination with the coal oil retort, constructed substantially as above set forth, I claim the opening, for the purposes set forth.

404. Machinery for Transmitting Motion; Mathaus Kaefer, City of New York.

Claim—The arrangement of the carriage and fly-wheel, in such relation to the crank that the weight of the carriage and of the fly-wheel acts on the crank, in the manner specified.

405. Field Rollers; George Lindley, Chicago, Illinois.

Claim—The vibrating scrapers, constructed and arranged so that the driver can operate them to clear the rollers of the earth adhering to them, when the machine is drawn in either direction. Also, constructing and arranging the platform so that the ends which support it may vibrate freely under it, when the rollers pass over uneven ground.

406. Churn; W. H. McClintock, Frankfort, Ohio.

Claim—The employment of the specified peculiarly constructed circularly vibrating suction and force-pump, in combination with a churn, constructed with a perforated partition.

407. Suction Hose; Charles McBurney, Roxbury, Massachusetts.

Claim—The rings, operating in the manner set forth.

408. Mode of Connecting and Disconnecting Machinery by means of a Belt; Tindal A. Madison, Terre Haute, Indiana.

Claim—1st, The combination of the shifting bar with the belt, the driving pulley, and the series of dead rollers, or their equivalents. 2d, The combination of the shifting bar and box with the gate or pawl, or their equivalents. 3d, The guide plate with its slot, in combination with the friction roller, or their equivalents, for the purpose of giving both forward and lateral motion to the belt, when moved from a state of rest. 4th, The series of dead rollers, for the purposes and arranged in the manner set forth. 5th, The lever, in combination with the slots, the stud, and connecting rod, for the purpose of operating the gate or pawl, in the manner described.

409. Water-tight Sink; Thomas J. Mayall, Roxbury, Massachusetts.

Claim—The production of water-tight sinks formed from vulcanized india rubber or gutta-percha, substantially in the manner set forth.

410. SEATS AND COUCHES FOR RAILWAY CARS; Thomas E. McNeill, Philadelphia, Pennsylvania.

Claim—1st, The end frame of the seat, with its slotted stop and the slotted plate secured to the side of the car, in combination with the back and its pins or bolts, when the several parts are adapted to, and arranged in respect to, each other, substantially as set forth. 2d, The arms, so hinged to the inside of the end frame as to be folded down under the seat during the day, and elevated so as to form supports for the couches during the night. 3d, The vertical frames hinged to the side of the car, and furnished with ledges to support two couches. 4th, The board, its rod, and the hangers, when arranged as set forth.

411. DEVICE FOR OPERATING THE INDEX OF TIME REGISTERS; Robert McKenna, Rossville, Tennessee.

Claim—The moving of the pencil, in the manner described.

412. HARVESTING MACHINES; John Macpherson, Pennington, New Jersey.

Claim—1st, The curved, slatted, flexible apron, when constructed in the manner set forth. 2d, The combination of the endless apron with the curved, slatted, flexible apron, arranged in the manner set forth.

413. CULTIVATORS; R. M. Melton, Criglersville, Virginia.

Claim—1st, The combination of the adjustable links with the adjustable slide, arranged as described, for the purpose of adjusting the distance between the ploughs. 2d, In combination with the curved plough beam, the coulter, constructed and arranged substantially as describ d, whereby the draft of the side ploughs is regulated by sliding the coulter on the beam and firm support given to the coulter in passing through compact soil.

414. LOCK FOR REPEATING FIRE ARMS; J. R. Mock, Elizabethtown, Kentucky.

Claim—The use of the coiled spring, in combination with the sliding lock, the catch, catch spring, and grooved barrel, and grooved breech-pin.

415. MANUFACTURE OF CORRUGATED BEAMS; Richard Montgomery, City of New York.

Claim—The roller, A, with its peculiarly formed projections and recesses, in combination with the roller, B, with its peculiarly formed projections and recesses, arrang d in relation to each other, as set forth. Also, the rollers, A and B, in combination with the former, C, said parts being arranged in relation to each other, as and for the purposes described.

416. APPARATUS FOR SEASONING LUMBER; M. R. Moore, Philadelphia, Pennsylvania.

Claim—The combined arrangement of the track rails, or their equivalents, with a steaming and drying chamber or vessel, fitted with steam pipes and stop-cocks or valves, so as to operate therewith, in the manner specified.

417. BROOM; D. J. Owen, Springville Lynn, Pennsylvania.

Claim—A broom provided with a leather bag, spring, and otherwise made as described.

418. CROSS-CUT SAWING MACHINES; G. W. Parker, Fitzwilliam, New Hampshire.

Claim—The cross-head and the several parts attached to it, whether arranged as shown in Figs. 1 and 2, or as in Fig. 3, together with the piece, X, or its equivalent, to work the arms, V and N, to raise the saw and the handle, to hold the saw when raised.

419. CHURN; J. R. Parker, Sing Sing, New York.

Claim—The combination of the rotating faces of the disk with the stationary faces, in the manner set forth.

420. CHAIRS FOR RAILWAYS; J. F. Peabody, Salem, Massachusetts.

Claim—The arrangement and application of rail bearers with respect to the elastic bearing, its cap plate, the base plate, and under the rails of the railway chair, and particularly with the elastic bearing and cap plate, arranged and protected by a recess, essentially as explained.

421. MILLS; A. E. Pirkey, Bradford, Illinois.

Claim—The described arrangement of the adjustable slides and the corner pieces, to operate in combination with the piston which receives its motion by means of a lever and wheels, in the manner specified.

[The invention consists in a device by which the distance between the sides of the shell and piston can be regulated, so that the flour or meal may be brought to any desired state of fineness.]

422. SCREW DIES; A. P. Pitkin, Hartford, Connecticut.

Claim—Making a screw plate, with both top and bottom parts which hold the die, cast or made on to the screw plate, in the manner described. Further, the making the inlet for the introduction of the die into its chamber, between the parts through the outside edge of the screw plate, as described.

423. CLOVER HULLERS; Christian Reif, Hartleton, Lewis Township, Pennsylvania.

Claim—The projections at different angles on the concave, in combination with the spiral rows of projects on the cylinder, as set forth.

424. NUT CRACKER; Ezra Ripley, Troy, New York.

Claim—The described nut-cracker or implement, consisting essentially of the fixed jaw, with its standard, the movable jaw with its slide, and the eccentric or cam with its handle and flanch, as described.

425. SAWING MACHINE FOR RE-SAWING BOARDS; A. C. Ross, Almont, Michigan.

Claim—1st, The arrangement of circular saw and stationary divider, in connexion with a permanent horizontal bed in re-sawing machines. 2d, The bell-shaped flanches or sockets of the saws, constructed as described.

426. SELF-ACTING WAGON BRAKE; Joseph Rosencrans, Avoca, New York.

Claim—The arrangement of means set forth, for operating the brake by the holding back of the team.

427. STOVES; George H. Russell, Baltimore, Maryland.

Claim—The combination, with the inner fire drum, of the cold air base, vertical side pipes, and elbow, with their dampers, cylindrical cover, or top drum, with its chambers and connecting tube, horizontal air-space and outlet, with air-drums, passage, front vertical register pipes, foot-warmer connecting pipes, and foot-warmer, with its register, ventilating registers, double smoke-pipes, with dampers, set as described, and divided outer smoke-drum, with its passage or passages, substantially as set forth.

428. CARPET FASTENER; A. M. Smith, City of New York.

Claim—The combination and arrangement of the point, A, lips, b b, slot, c, bearing, d, lips, e e, point, f, hook, g, lips, h h, bearings, i i, as specified.

429. MANUFACTURE OF BELTING; Charles, E. Smith, Philadelphia, Pennsylvania.

Claim—The manufacture of continuous belting or boards by uniting pieces of band iron, by lapping and riveting two beveled ends, so as to produce a rhomboidal joint, in the manner described.

430. CORDAGE MACHINERY; George Stephenson, Northfield, Indiana.

Claim—The employment of a series of movable bearing cross-bars with side pivots or gudgeons, the ends of the cross-bars being supported by longitudinal slots or grooves in the flyer bars, and connected to each other by elastic straps or thongs, whereby the cross-bars are made to press gently upon the ends of the spools (which are mounted upon the side pivots), to resist slightly the rotary motion thereof, and also admit of the occasional removal of one or more of the spools, without disarranging others of the series, the cross-bars, spools, and elastic straps being arranged in the manner described.

431. AXLE-BOX FOR RAILROAD CARS; Levi Stevens, Fitchburg, Massachusetts.

Claim—A box made of anti-friction metal and backed with a casing of bronze, the bronze passing through the anti-friction metal, and resting upon the axle, for the purpose described.

432. CONDENSING STEAM ENGINES; John Sutton, Assignor to self and DeWitt C. Van Tuyl, City of New York.

Claim—1st, The arrangement of the combined air pump and condenser piston, K, to act independently of the walking beam of the engine, so that a portion of the exhaust steam, while the piston, F, is first completing and commencing a stroke, shall impart a full stroke to the piston, K, as described. 2d, The arrangement and combination of the forked levers, Q S, the crank, E, lever, R, and piston rod, K′, so that by the action of the piston, K, the crank, E, will be assisted in passing the dead points, but during other portions of the crank movement, the parts above named will be disconnected from the crank, E, as described.

[In this invention, the air pump and cylinder of a condensing engine are combined, and the cold water injection is so applied that condensation takes place in the air pump, and the use of a separate vessel as a condenser dispensed with. The air pump is operated by the direct pressure of the exhaust steam upon its piston, without any aid from any other part of the engine, and the surplus of power in the air pump over and above what is necessary for the discharge of the water of condensation from it is used to help the crank or cranks past the centres.]

433. MANUFACTURE OF WRENCHES; George C. Taft, Worcester, Massachusetts.

Claim—The peculiar mode of constructing the head and shank of screw wrenches, namely, by first forming or constructing the head and shank or bar separately, as described, and then uniting the head and shank after the shank has been inserted into the depression first made in the head by welding, the whole operation being substantially as described.

434. SEEDING MACHINES; T. H. Tatlow, Jr., Palmyra, Missouri.

Claim—1st, The employment or use of the covering hoe, operated from the supporting wheel through the medium of the rollers, bar, J, and the bars, F I, connected by the rod, H, as described. 2d, The share, O, provided with the curved bars, j j, in connexion with the shares, M N, and hoe, arranged as set forth.

435. CORN MILLS; J. W. Taylor, Philadelphia, Pennsylvania.

Claim—The application and arrangement of the oblique projections to the shell or concave, operating in the manner specified.

436. TAILORS PRESSING MACHINE; J. W. Thorp, Hillsboro', New Hampshire.

Claim—Raising the heater from the bottom of the hollow goose, either by means of the projections formed on the bottom of the heater, or by adjusting screws, or their equivalents.

437. BEE-HIVES; S. H. Walker, Somerville, Tennessee.

Claim—The moth decoy entrance, provided with the jutting lips or ledges arranged just within the bee entrance across its entire extent, both above and below, in the manner specified. Also, the construction and arrangement of the cross-bars attached to a supporting cross-piece, and with open spaces around their ends, in the manner set forth.

438. BORING MACHINE; John Waugh, Elmira, New York.

Claim—The arrangement of those mechanical appliances in a peculiar manner, substantially as set forth.

439. GAS REGULATORS; D. Wheeler, Fairfield, and Isaac Little, Bridgeport, Connecticut.

Claim—The combination of a self-acting discharge pipe or siphon with the chamber of a gas regulator, as described.

[An inverted siphon is attached to the gas regulator, and arranged relatively to the outlet by which the burners are supplied, and to the other parts of the regulator, that while containing a column of water or other liquid sufficient to balance the pressure of the gas, it will constitute a self-regulating means of escape for any water or liquid matter that may result from condensation in the pipes between the regulator and the burners.]

440. FRICTION SPRING FOR SUPPORTING WINDOW SASH; E. D. Williams, Philadelphia, Pennsylvania.

Claim—Providing with friction springs having sharpened projections or spurs for cutting their own grooves, as set forth.

441. COTTON AND HAY PRESSES; Samson Wolff, Vicksburgh, Mississippi.

Claim—The combination of a conical spiral wheel or pinion with an inclined rack, when the latter is set oblique to the axis of the pinion, in the manner described.

442. MUSQUITO BAR; Thomas S. Williams, Enterprise, Mississippi.

Claim—The folding musquito net or bar, as described.

443. SEATS AND COUCHES FOR RAILROAD CARS; Theodore T. Woodruff, Philadelphia, Pennsylvania.

Claim—The combination and arrangement of the two frames with each other and with the supports therefor, connected with each compartment of a car, the said frame, when spread out, forming couches for two persons, on the same level with the seats, and when transformed one of the said frames forming seats, and the other the back for such seats. Also, connecting the frame which forms the seats with the frame which forms the back, by means of links, connected with one of the said frames by means of hinged joints, and with the other of the said frames by means of sliding hinged joints. Also, in combination with the frame for the main seats, the auxiliary seats which slide under the frame for the main seats. Also, the frame for an elevated couch, when combined with the car, by means of sliding hinged joints. Also, in combination with the elevated couch next to the side of the car, or the equivalent therefor, the front elevated couch, so connected with the car as to admit of being let down to form part of a double couch, and thrown up towards the roof of the car when not wanted as a couch.

444. Self-acting Presses; Lester L. Bond, Chicago, Illinois, Assignor to self and Giles B. Williams, City of New York.

Claim—1st, The arrangement for connecting the press beam with the levers by the connecting bars, whereby the press is made to operate from above and below. 2d, The socket shoe and the ratchet plate, or their mechanical equivalents, for altering and gauging the power of the press.

445. Machines for Making Upholstery Springs; C. A. and S. W. Young, Providence, Rhode Island.

Claim—1st, The cutters, attached to the machine and arranged relatively with the rolls and bar, when the movable cutter is actuated automatically by suitable mechanism to cut the springs as formed from the continuous wire. 2d, The bar, attached to the lever, or other part of the machine or framing, when provided with a bend to project over the uppermost roller, for the purpose of guiding and ensuring the turning or bending of the wire, as set forth. 3d, The plates, when used in connexion with the shears, for the purpose of cutting off the springs and bending the ends thereof simultaneously.

446. Machines for Measuring Cloth; John W. Drummond, Assignor to Horace H. Day, City of New York.

Claim—The combination of the measuring wheel, in combination with the spring block, or the equivalent thereof, for holding the cloth to the periphery of the wheel, and for stopping the said wheel the moment the cloth has passed off.

447. Coffee Pots; D. G. Fletcher, Assignor to self and Henry Weiskopf, Racine, Wisconsin.

Claim—The box-like strainer arranged with a hinged top, so that access can be had to the same from the inside as well as from the outside, and that the same can easily be cleaned.

448. Refrigerator; Wm. H. Lazelle, Assignor to self and Elbridge B. Lazelle, Boston, Massachusetts.

Claim—The combination and arrangement of the siphon pipe, water space, and ice-box, open and beveled at one end, as set forth.

449. Dry Gas Metres; Hugh Logue, Assignor to self and Daniel P. Vandergrift, Philadelphia, Penna.

Claim—So constructing one of the partitions between two of the chambers of a dry gas metre, that it may afford a passage for the gas from the inlet pipe to the central opening of the valve seat, substantially as set forth.

450. Hemp Brake; Henry F. Mann, Assignor to self and Wm. J. Walker, Laporte, Indiana.

Claim—1st, The combination of the adjustable cams or arms with the breaker, as constructed, the whole being arranged as described. 2d, The adjustable spring, as arranged and operated for the purposes set forth.

451. Machine for Cutting India Rubber into Threads; Henry Messer, Roxbury, Assignor to Charles Rice, Boston, Massachusetts.

Claim—The arrangement and combination of the rotating table and the adjustable cutters, as described.

452. Grinding Mills; A. Orvis, Niagara, Assignor to self and Downs & Co., Seneca Falls, New York.

Claim—The construction and arrangement of cylinder, D, and concave, F, with supplementary cylinder, G, whereby the rhomboidal teeth, f and g, serve to adjust the parts to efficient action by means of the longitudinal movement of the collar, e, on the shaft, B, substantially as set forth. Also, the peculiar conformation of the grinding surfaces of the cast iron cylinder, E, and concave, H, consisting of the alternate intersection of the raised and depressed corrugations thereof, in the manner described. Also, the combination and arrangement of the two concaves, F and G, spout, j, and divided winged partition, R, or its equivalent, whereby the operation of cracking and grinding in said concaves may be conjoint or separate, substantially in the manner described. Also, the automatic rapper, V, arranged and operated as described, for the purpose of keeping the bolt free from obstructions, and rendering its action efficient.

453. Sofa Bedstead; Wm. H. Tendler, Assignor to self and John F. Moeschlin, Cambridge, Massachusetts.

Claim—The improved sofa bed, constructed not only with each of its arm-rests formed in two parts and hinged together, arranged and applied to the back and bed-frame, but with its seat hinged to the bed-frame, so as to be capable of being moved with respect to it and the arm-rests. Also, the combination of the pillow and foot-rests with the arm-rests and seat frame or seat applied to the frame, the whole being made to operate together essentially as explained.

454. Mill Drivers; Ferdinand Walters, Assignor to C. F. Walters and S. H. Stout, Covington, Kentucky.

Claim—The driver, constructed and arranged with reference to the shaft and cap, substantially as set forth.

455. Heel of Boots and Shoes; Alfred B. Wilton, Assignor to self and Charles Adams, Dorchester, Mass.

Claim—The improvement of the dished or concave elastic heel, as made with the air channel leading out of the concavity, and arranged as described.

Extensions.

1. Machine for Ginning Cotton and Wool; Stephen R. Parkhurst, City of New York; patented May 1, 1845; extended May 3, 1859.

Claim—Arranging the metallic rings composing the burring cylinder so near together that no burrs or seeds, &c., can fall in between them, the rings having hooked teeth cut in the periphery, and so placed around the cylinder as not to have the teeth on any two adjoining rings to come opposite to each other, by which the wool or cotton is drawn in below the surface of the rings and the seeds or burrs are cleaned off. Also, the combination of the burring cylinder with the feeding cylinders and trash cylinder, to separate the fibres of cotton or wool from foreign or useless substances.

2. Printing Presses; Richard M. Hoe, City of New York; patented May 1, 1845; extended May 3, 1859.

Claim—The lifting of the cylinder when it is desired that it should not bear on the form as it revolves, such lifting being effected by means of apparatus connected with the lever, arranged as described. Also, the manner of constructing the spring box or apparatus used by me for checking the momentum of the bed in a cylinder press, but which may be advantageously applied in other machines for a like purpose, said spring box or apparatus being furnished with a centre shaft carrying a toothed wheel that gears into wheels or pinions on several surrounding shafts, the whole of which shafts carry spiral springs, arranged and combined so as to co-operate with each other in the manner described.

3. Stoves; F. L. Hedenberg, City of New York; patented May 7, 1845; extended May 10, 1859.

Claim—The particular manner, as set forth, in which I arrange and combine the flue and air-heating

spaces, and the pedestal of my stove, the hot air space being between the ascending and descending draft, the descending draft spreading around the base of the stove.

4. THE MANUFACTURE OF INDIA RUBBER FABRICS; Nelson Goodyear, late of Newtown, Connecticut, Henry B. Goodyear, Administrator; patented May 13, 1845; extended May 17, 1859.

Claim—The intermingling and combining fibrous substances with the gum in forming india rubber fabrics, solid and firm in the body, with a smooth surface resembling leather.

ADDITIONAL IMPROVEMENTS.

1. JOURNALS OF RAILROAD CARS; Wm. Baker, Utica, New York; patented August 11, 1857; additional dated May 3, 1859.

Claim—1st, Placing a cylindrical coiled spring around the piston, immediately above the socket to be used, instead of the volute spring below the piston and within the socket. 2d, I do not claim generally a ball valve, as this is in common use in various connexions, but I claim the use of the ball valve, in combination with the enlarged chamber, and the arrangement described for communicating and sustaining the oil in contact with the journal. 3d, I claim the use of the flat spring to be used for vibrating the piston, together with the arrangement I have described for seating the piston on the spring.

2. MANGLES; D. Cumming, Jr., Mobile, Alabama; patented July 27, 1858; additional dated May 3, 1859.

Claim—The employment or use of the cylinder, C, having an elliptical surface upon a portion of its periphery, and having a fixed axis of rotation, the cylinders, D, having a movable axis of rotation, and the eccentric cams arranged upon a movable rod, and their pressure being regulated by suitable springs.

3. MODES OF VENTILATING RAILROAD CARS; D. H. Fox and John Fink, Reading, Pennsylvania; patented May 8, 1855; additional dated May 10, 1859.

Claim—As an improvement on our patent aforesaid, the construction of the fan chambers with outlets at each extremity, and their combination with the other portions of the ventilating apparatus.

4. ORE-CRUSHING MACHINES; Samuel F. Hodge, Detroit, Michigan; patented May 26, 1857; additional dated May 17, 1859.

Claim—The alternate lifting and dropping of a stamper or hammer, by means of the combination of the vertical rod with two or more clamping rollers, the peripheries of which are not complete circles.

5. COOKING STOVES; Samuel B. Spaulding, Brandon, Vermont; patented June 22, 1858; additional dated May 17, 1859.

Claim—The extension of the flues under the hearth, as described.

6. BOW WHIFFLE-TREES; Freedom Monroe, Romeo, Michigan; patented Aug. 26, 1858; additional dated May 24, 1859.

Claim—The bearing bar, the chain and braces attached thereto, and the paddled swivel joint, to be used in combination with my improvement in harness, disclaiming the original invention heretofore patented.

7. APPARATUS FOR EVAPORATING SACCHARINE JUICES; Lyman P. Harris, Mansfield, Ohio; patented Jan. 18, 1859; additional dated May 31, 1859.

Claim—1st, The application of one or more dampers to the movable furnace; also the cooling surface on the evaporator connected therewith. 2d, The movable flue, as described. 3d, The broad hook or supporter, or its equivalent, as set forth.

RE-ISSUES.

1. GAS BURNERS; John R. O'Neil, Kingston, New York, Assignee of Yarnall Bailey, Philadelphia, Penna.; patented October 12, 1858; re-issued May 3, 1859.

Claim—Producing a light which may be increased or diminished at pleasure, by means of the adjustable heater or heat receivers, operating in connexion with a wick tube or holder, and the flame of the lamp or burner.

2. KNITTING MACHINES; Nelson P. Aiken, Troy, New York; patented July 13, 1858; re-issued May 3, 1859.

Claim—Stopping a knitting machine when the yarn accumulates in its needles by the action of the accumulated yarn.

3. SHUTTLES FOR WEAVING CLOTH; James Baldwin, Nashua, New Hampshire; patented January 31, 1840; extended for seven years from and after January 31, 1854; re-issued May 3, 1859.

Claim—Furnishing the shuttle with a spring and catch, so arranged that the bobbin will be received or released at one operation.

4. THE MODE OF CONVERTING THE BACKS OF CAR SEATS INTO BEDS OR LOUNGES; Henry B. Myer, Buffalo, New York; patented September 19, 1854; ; re-issued May 3, 1859.

Claim—1st, The use of the backs of car seats for forming upper horizontal beds or lounges. 2d, So arranging the backs of contiguous seats, that they meet and remain in the same horizontal plane. 3d, The use of a cushioned surface intermediate between the cushioned surfaces of two car seats, so as to form with the same a horizontal bed, berth, or lounge, said intermediate cushion forming an attachment to, and appearing as part of, the car seat, when not adjusted to aid in forming a berth, bed, or lounge. 4th, Forming a continuous line of lower horizontal beds, berths, or lounges, of a series of car seats in railroad cars, by uniting the several seats so as to fill up the entire space between the seats with adjustable cushioned attachments of the seats, whatever be the character or disposition of said attachments, so long as they form and appear as parts of the seats, when not adjusted to form said continuous line of lower beds, berths, or lounges.

5. RETORTS FOR DISTILLING OILS FROM COAL; John Nicholson, Alleghany, Pennsylvania; patented February 15, 1859; re-issued May 3, 1859.

Claim—1st, The use of a straight or curved, or straight blade or blades placed on the agitators or arms of shaft, for the purpose of agitating, lifting, mixing, and bringing all parts of the mass within the retort in contact with the heat. 2d, The arrangement near the outer edge of one end of a retort, of four or more supply and discharge openings, and on the other end near the outer edge of four or more exit pipes placed on a line with, and opposite to, the supply and discharge openings.

6. COFFEE POTS; Wm. H. Elliot, Plattsburg, New York; patented January 25, 1859; re-issued May 10, 1859.

Claim—1st, The combination of boiler, still-worm condenser, conducting plate, and the external opening

of the still-worm at g′, when these devices are so arranged in relation to each other that an opening to the external air shall be provided for the non-condensible gases, while the condensible vapors are reduced to a liquid without coming in contact with the condenser water, and then turned by conductors into the boiler. 2d, The arrangement of the joint below the spout, so that vapor can pass through the spout without first passing the joint. 3d, The employment of conductors, in combination with the condenser, for the purpose of filling the water joint or keeping it full.

7. Mowing and Reaping Machines; J. W. Mulley, Amsterdam, New York; patented Dec. 16, 1856; re-issued May 10, 1859.

Claim—1st, Connecting the frame of the platform with the frame carrying the driver and raker's seat, in the manner set forth, namely, securing the relative position of the two frames by means of the brace in the rear, and the laterally inclined draw-shoe in front. 2d, The shoe, in combination with the tongue attachment in front thereof, the said shoe being constructed and arranged as described. 3d, The rod and the rails, connected in the manner described, in combination with the pole, the rocking shaft, and the lever. 4th, The arrangement in relation to the driver's seat of the lever and mechanism connected therewith, for raising and lowering the cutter bar, whereby the sickle may be raised in the manner described.

8. Grain Separators; John R. Moffitt, Piqua, Ohio; patented Nov. 30, 1852; re-issued March 23, 1858; re-re-issued May 17, 1859.

Claim—The endless chains, composed of metallic links provided with protuberances or depressions, when used in combination with suitable driving chain gears to impart a positive motion to the straw-carrier of a threshing and separating machine.

9. Grain Separators; John R. Moffitt, Piqua, Ohio; patented Nov. 30, 1852; re-issued March 23, 1858; re-re-issued May 17, 1859.

Claim—In combination with a receptacle in which the tailings are deposited by the winnowing apparatus, the arrangement of the screw elevator in relation to the threshing cylinder, for the purpose of returning the tailings to be re-threshed.

10. Grain Separators; John R. Moffitt, Piqua, Ohio; patented Nov. 30, 1852; re-issued March 23, 1858; re-re-issued May 17, 1859.

Claim—The reversible screen and delivery spout, arranged with, and to the discharging spout of, the "fanning mill" or "shoe" of a threshing machine, so as to be isolated from the winnowing arrangement, and made to deliver at either one side or the other of the machine.

11. Grain Separators: John R. Moffitt, Piqua, Ohio; patented Dec. 1, 1857; re-issued May 17, 1859.

Claim—The arrangement of disconnected shafts, carrying pinion chain gears, rotated at equal speeds from a single shaft or driver, and acting to drive the endless apron from its lower end, while permitting the escape of the straw through the lower openings of the apron.

12. Machinery for Preparing Oval Picture Frames; Wm. Gardner, City of New York; patented August 17, 1858; re-issued March 15, 1859; re-re-issued May 17, 1859.

Claim—The combination of a scraper adapted to the form of the moulding, with the revolving face-plate of a lathe, when the said scraper is so arranged as to be self-adjusting laterally to the said moulding.

13. Grain Separators; John R. Moffitt, Piqua, Ohio; patented Dec. 1, 1857; re-issued May 17, 1859.

Claim—The construction and arrangement of the rotary beater within the apron, in combination with the falling sections.

14. Grain and Grass Harvesters; C. Aultman & Co., Canton, Ohio, Assignees of Philo Sylla and Augustus Adams, Elgin, Illinois; patented September 20, 1853; re-issued May 17, 1859.

Claim—1st, An elevated binding table, in combination with the platform for receiving the grain as it is cut. 2d, The combination with the binding table of one or more binders' stands on a lower level than that of the table. 3d, The combination of a binding table with a binders' stand, having an elevated side for the binder to rest his legs against, and thereby steady himself without the aid of his arms, both of which are thus left at liberty to do the binding. 4th, The arrangement of the rakers' and binders' stands, so that the grain may be raked from the platform, and delivered upon the binders' table before the several binders' stands. 5th, The arrangement of the dumping-tray with the rakers' and binders' stands.

15. Grain and Grass Harvesters; C. Aultman & Co., Canton, Ohio, Assignees of Philo Sylla and Augustus Adams, Elgin, Illinois; patented September 20, 1853; re-issued May 17, 1859.

Claim—1st, The combination of the finger beam and the main frame with a yielding coupling arm, whereby the progressive movement of the finger beam over the ground will be controlled by the main frame, and its upward and downward movements by the undulations of the ground over which it is drawn. 2d, The combination of a yielding coupling arm and a yielding brace bar with the finger beam and main frame. 3d, The combination of the yielding bars and the removable bolts, or the equivalent thereof, with the finger beam and main frame, whereby the finger beam may be allowed to slide loosely on the ground to adapt the machine to mowing, or be held firmly above the ground to adapt the machine to reaping.

16. Grain and Grass Harvesters; C. Aultman & Co., Canton, Ohio, Assignees of Philo Sylla and Augustus Adams, Elgin, Illinois; patented September 20, 1853; re-issued May 17, 1859.

Claim—The short finger beam, in combination with the yielding connexion with the main frame, or its equivalent.

17. Grain and Grass Harvesters; C. Aultman & Co., Canton, Ohio, Assignees of Philo Sylla and Augustus Adams, Elgin, Illinois; patented September 20, 1853; re-issued May 17, 1859.

Claim—The combination of the finger beam with the hinges by which it is drawn, arranged above the plane of the cutter.

18. Grain and Grass Harvesters; C. Aultman & Co., Canton, Ohio, Assignees of Philo Sylla and Augustus Adams, Elgin, Illinois; patented September 20, 1853; re-issued May 17, 1859.

Claim—The combination of a counterpoise weight, or the equivalent thereof, with that end of the finger beam next the main frame, to equalize its pressure upon the ground. Also, the combination of a counterpoise weight, or the equivalent thereof, with each or either end of the finger beam, to diminish its pressure upon the ground.

19. Grain and Grass Harvesters; C. Aultman & Co., Canton, Ohio, Assignees of Philo Sylla and Augustus Adams, Elgin, Illinois; patented September 20, 1853; re-issued May 17, 1859.

Claim—The combination of a stop with the mechanism for connecting the finger beam with the main frame, and allowing it to rise and fall.

20. Manufacture of India Rubber Goods by means of Zinc Compounds; Horace H. Day, City of New York, Assignee of Henry G. Tyer and George Helm, New Brunswick, New Jersey; patented Jan. 30, 1849; re-issued August 7, 1849; re-re-issued May 24, 1859.

Claim—India rubber fabrics made by the combination of caoutchouc, in its several varieties, with the sulphuret of zinc, or the bi-sulphuret of zinc, or the hyposulphite of zinc, or the sulphite of zinc, and also with zinc compounds in their several forms, as set forth, and sulphur, and in combination with these in either case, the submitting said compound to the action of steam at a high temperature, the whole being combined and manufactured substantially as described.

21. Apparatus for Raising Water; Wm. T. Barnes, Buffalo, New York; patented March 20, 1849; re-issued May 24, 1859.

Claim—1st, The combination of a casing whose sides slope outward from the induction opening with a revolving piston, the edge of whose blades conform to, and run near to, the sloping sides of the casing or the spiral rib. 2d, In combination with a casing whose sides slope outward from the eduction openings. I claim a rotating piston, with fixed blades, inclined upon the face to the axis of the piston rod. 3d, Dividing the stream of liquid as it enters the casing containing the rotating piston, by causing it to pass through two or more induction openings, arranged so that the blades of the piston pass over these openings.

22. Inkstands; Thomas Robjohn, City of New York; patented August 25, 1857; re-issued May 24, 1859.

Claim—1st, The arrangement for flexing the elastic diaphragm, by attaching a mechanism in connexion with the cover for the ink cup, that the opening and closing thereof shall effect the raising or discharge of the ink, or other fluid, into or from said cup. 2d, The cover, arranged and operating as above set forth, in combination with the elastic or flexible diaphragm and a non-corrosive fountain or ink cup, when operating as specified. 3d, The combination and arrangement of cam lever and plunger, or the equivalents thereof, for effecting the raising or discharge of the ink by raising or closing the cover of the non-corrosive fountain cup. 4th, Arranging the cam centres in such relation to each other that, by raising the cover, the requisite depression of the diaphragm will be produced to obtain the required result.

23. Cracker Machine; John McCollum, City of New York; patented March 23, 1852; re-issued May 31, 1859.

Claim—The combination of adjustable springs with a cracker cutter and its resisting surface or bed.

24. Machine for Creasing and Blacking Leather for Harness; Adolph Stempel, City of New York; patented Nov. 2, 1858; re-issued May 31, 1859.

Claim—1st, The pressure roller and the creasing and embossing rollers, in combination with the color fountains and felt rolls, arranged to operate as set forth. 2d, The arrangement of the embossing rollers with their projection flanches, to operate in combination with the guides, in the manner specified.

25. Plates for Boiler Holes and Tops of Stoves; David Stuart and Richard Peterson, Philadelphia, Penna., Assignees (through mesne-assignment) of John B. Chollar, Albany, New York; patented February 6, 1849; re-issued May 31, 1859.

Claim—Constructing a cross-piece for cooking stoves and ranges with a hollow chamber, and with the openings to allow air to pass into the said chamber, as set forth.

26. Grinding and Polishing Knives; James Dodge, Waterford, Assignor to self and David Blake, Albany, New York; patented October 12, 1858; re-issued May 31, 1859.

Claim—Grinding and polishing articles, and forming their surfaces upon or against the periphery of a grindstone or polishing wheel, or other analogous reducing surface, by attaching them to the periphery of a revoking drum or cylinder. Also, making matrices in the periphery of a wheel to which a series of articles to be ground are attached, said matrices being adapted to give the required shape to the articles to be ground, so as to grind, polish, and shape such articles in a uniform manner. Also, in combination with said matrices, attaching and supporting the articles to be ground upon the cylinder, in such manner as to allow them to rock or accommodate themselves thereon, whereby their surfaces may be shaped either convex, flat, or concave.

27. Gas Lamps; George H. Bechtel, Assignee (through mesne-assignment) of Horatio G. Sickles, Philadelphia, Pennsylvania; patented August 7, 1849; re-issued May 31, 1859.

Claim—1st, Forming a valve within the adjustable gas chamber, and a seat for the said valve on the tube which contains the wick, so as to regulate and extinguish the light when required, whether the said valve be made and arranged in the manner described, or other means substantially the same, by which similar results may be produced. 2d, The employment of the safety valve, in combination with the guard, constructed substantially as described. 3d, The guard, in combination with the combined burner and generator, arranged in the manner set forth. 4th, Combining the generator, burner, ring, and guard, in a single piece, made to ascend and descend simultaneously, in the manner set forth.

Designs.

1. Burial Case; John McMurthry, Assessor to George C. Murthry, Fayette, New York; dated May 3, 1859.
2. Spoon and Fork Handles; Wm. H. Lewis, Glastenbury, Connecticut; dated May 3, 1859.
3. Stoves; Sherman S. Jewitt and Francis H. Root, Buffalo, New York; dated May 3, 1859.
4. Watch Guards; George Blanchard, City of New York; dated May 10, 1859.
5. Stove Plate; J. W. Lane, Newton, New Jersey; dated May 10, 1859.
6. Stoves; David Hathaway, Assignor to Fuller, Warren & Co., Troy, New York; dated May 17, 1859.
7. Sepulchral Monuments; Richard Barry, Boston, Massachusetts; dated May 24, 1859.

JUNE 7.

1. Printing Oil Cloths; James Albro, Elizabeth, New Jersey.

Claim—Forming ornamental figured surfaces on oil cloth, by raising parallel ridges or surfaces, b, on the ground color, when in a soft or green state, by means of a properly prepared block pressed upon it; and then forming parallel ridges or raised surfaces, d, at right-angles thereto, and in the form of the design or desired configuration, by means of a properly prepared block. It being understood that I claim the privilege of having either the ground, b, or figure, d, one of them only, if desired, composed of dots or broken lines or ridges, in order to obtain a similar effect.

2. Breakwater; D. Hillen Armour, Columbia, Texas.

Claim—The projecting or overhanging sand plate, applied in combination with the diagonal walls of the breakwater, as described.

[This breakwater is designed to protect a channel across a bar from the flow of sand which comes in upon the bar with each tide, and thus keep the channel open without the necessity of making the channel in the bar narrower than the channel in the river. This will, of course, give accommodation to more ships entering a river with a tide, and will ensure a course for ships even at low water.]

3. Washing Machine; D. S. Ayres, Hope, New Jersey.

Claim—The revolving discs or heads with the mode of operating the same, as applied to washing machines.

4. Device for Raising Water; J. A. Ayres, Hartford, Connecticut.

Claim—The wind-wheel, vane, endless chain, with buckets and weight attached, the cylinder and annular receiving trough, arranged for joint operation substantially as set forth.

5. Revolving Fire Arms; Thomas Bailey, New Orleans, Louisiana; patented in England, Jan. 17, 1859.

Claim—1st, The placing of the within named working or actuating means within the body, as set forth. 2d, The revolving chamber working on two adjustable centres of suspension instead of in the ordinary way. 3d, The mode described of connecting the barrel to the body. 4th, The stopping or retaining of the revolving chamber by means of a spring stop acting on the ratchet, such stop being actuated by a cam on the tumbler. 5th, The notch or cavity in the cap guard or cock-nose, to fit upon the solid part of the chamber, and retain the chamber in a safe position.

6. Bridle Bits; J. B. Baker, Syracuse, New York.

Claim—The attachment, as described, of sliding rings or rein connexions to the curb bars of bridle bits, when the same are operated upon by springs attached to the bit, in the manner set forth.

7. Chimney Cowl; Henry Bedlow, Newport, Rhode Island.

Claim—The arrangement and combination of the chimney top or tube, a, chamber, f, tubes, g, or other external draft passages and deflectors, the tube chamber and draft passages communicating with each other and the external air, to operate as set forth.

8. Method of Sawing Shingles from the Bolt; N. Boardman, Fond du Lac, Wisconsin.

Claim—1st, The employment or use of two bolt carriages, when used in connexion with the adjustable planes, and arranged in the relation with the circular saw, as shown, so that a shingle may be sawed from each bolt at each movement of its carriage, and the two bolts operated upon simultaneously by means of one and the same law. 2d, The adjustable or tilting tracks or bolt frames, in combination with the reciprocating carriages and saw, arranged to operate as set forth.

9. Enamel Compositions for Bricks, &c ; Decius W. Clark, Bennington, Vermont.

Claim—The enamel or glaze for pottery ware, or other articles formed of the ingredients, and substantially as specified.

10. Improvement in Tanning; Jehu Brainard and W. H. Burridge, Cleveland, Ohio.

Claim—The described process of treating skins or hides in a preparation of liquor or liquors, as described.

11. Pocket-handle for Billiard Tables; John M. Brunswick, Cincinnati, Ohio.

Claim—The pocket-handles, arranged and secured as described, and formed of vulcanized gutta-percha or india rubber.

12. Machines for Burring Wool and Ginning Cotton; F. A. Calvert and C. G. Sargent, Lowell, Mass.

Claim—A cylinder having spaces between the teeth for the accommodation of the seed, in combination with a revolving guard, operating in the manner described.

13. Corn Huskers; J. C. Clapp, Seneca Falls, New York.

Claim—The combination and arrangement of the carriage, fly-clearer, cross lever, concaves, and gauge, blade, and tread lever, operating conjointly as set forth.

14. Method of Jointing Shingles; S. C. Coffin, Lawrenceville, Pennsylvania.

Claim—So combining with the horizontal saw that saws the shingle from the bolt, the transverse piece, and carriage upon it, so that the same saw that cuts the shingles from the bolt may be used for joining said shingles.

15. Knitting Machines; Enoch Colvin, Poultney, Vermont.

Claim—1st, The combination of the needle arm and the iron rim upon the ring, constructed for raising each needle by itself, and completing each stitch before another is begun. 2d. The cylinder for reversing and regulating the motion of the machine while forming the heel and toe. 3d, The combination of the notched wheel, t, the toothed bar with its pointer, the cylinder, the elevating arm, the elevating bar and cam thereon, and the pin on the wheel, by means of all which the motion of the machine is reversed back and forth, and regulated so as to knit upon a straight hose flaps of the proper form for the heel and toe. 4th, The wheel, p, and the elevating arm, combined with the several parts and devices mentioned in the last preceding claim or paragraph, as above described, for setting in motion at the proper juncture the machinery for regulating the formation of the flaps for the heel and toe.

16. Light Shade for Billiard Table; David Conlan, City of New York.

Claim—A shade for billiard tables, &c., having two reflecting parts, and otherwise made as described.

17. Rakes; Thomas Crane, Fort Atkinson, Wisconsin.

Claim—My improved harvesting rakes for gathering and elevating cut stalks of grain preparatory to binding the same into sheaves, when the said rake is composed of side handles, gathering fingers, and swinging legs, or the equivalents of the same, as set forth.

18. Lock; Thomas Dougherty, Macon, Georgia.

Claim—The employment of the spring tumblers, when constructed and operated in the manner described, in connexion with the bolt, the said springs being detained by the key to let the bolt slide.

19. Chain Pump; Daniel Du Pré, Raleigh, North Carolina.

Claim—1st, The endless chain for raising water, composed of the curved detachable links, when said links are constructed and united in the manner set forth. 2d, Keeping the chain stiff between the upper and lower

pulleys, by means of projections on the links. 3d, The combination of the curved links with the peculiarly shaped curved buckets, when constructed in the manner set forth.

20. RAILROAD CHAIRS; Wm. B. Dunning, Geneva, New York.

Claim—1st, The peculiar form of a partly raised and double-slotted bed-plate. 2d, The peculiar form and position of the clamps, one part of them being confined and borne down on the tie by the weight of the rail and all above it, and the other part, viz: the jaw, resting upon the flanch of the rail and holding it fast. 3d, The combination of the several parts, as described, or their mechanical equivalent.

21. HYDRANTS; James Fay, Baltimore, Maryland.

Claim—The arrangement of the stock and chamber, as constructed with the india rubber ball, rod, opening in the top of box, nut, spring, valve stem, valve, and thimble, the several parts being used and operating conjointly, in the manner specified.

22. HORSE POWER MACHINES; Wm. Field, Providence, Rhode Island.

Claim—Arranging and supporting a hollow driving shaft, and the driven shaft passing through the driver, whereby both driver and driven shaft turn in the same direction, and both ends of the driver are fully supported by boxes independent of the shaft passing through it, while at the same time the bearing of the shaft passing through the hollow driver will be on the driver only at a point directly opposite its journal, so that any slight displacement of either shaft will not cause them to bind on each other so as to increase the friction of the machine.

23. MACHINE FOR OPENING OLD ROPE; Archibald Ford, Newport, Kentucky.

Claim—The elevated bar provided with cavities, arranged in the described relation to the feed mechanism and drum, and operating in combination with the latter, to preparatorily open the butts of the rope.

24. MODE OF STARTING CITY RAILROAD CARS; George P. Frick, Baltimore, Maryland.

Claim—The application of a lever acting temporarily upon the axle of a railway carriage, or other wheeled vehicle, in combination with the pulley and chain, and whether the pulley is of uniform or different diameters, as described. Also, such lever, in combination with the ratchet wheel and catch, in their application to railway or other wheeled vehicles. Also, the cord, whereby the lever may be loosened from the catch at the will of the driver, in combination with the said lever, and catch pulley, and chain, when applied to a railway carriage, or other wheeled vehicles. Also, the combination of the catch and ratchet wheel with the chain and weight, described in the foregoing specification, whereby the engaging and disengaging of the catch is operated by the motion of the draft bar.

25. LEGS FOR PIANOS; Felix and Charles Gelin, City of New York.

Claim—The glass socket, so mounted in the legs of musical instruments, that the escape of sound from the instrument to the floor is checked, without injuring the appearance or endangering the strength or durability of the instrument.

26. MONEY BOXES FOR STAGES, &c.; T. W. Gibbons, Franklin, New Jersey.

Claim—1st, The box provided with the drawers, the former having a flap or door in its bottom, and arranged to operate as set forth. 2d, The change slide or plate, one or more, used in connexion with tubes, and arranged relatively with drawer to operate as set forth. 3d, In combination with the drawers and change plate or plates, the bell and index, and dial, arranged as set forth.

27. SAFETY CAGE FOR COAL SHAFTS; D. Glover, Township of Cass, Schuylkill Co., Pennsylvania.

Claim—The construction of the cage in two separate sections, separated at the guides, and so connected by hinges at the top of the bottom of the sill that, when the rope or chain used in hoisting breaks, or the power ceases to operate, the cage shall open at the top where the sections are joined, and the height and weight of each section shall operate as a lever and weight to force the iron shoe on the ends of the sills and pieces powerfully against and into the guides, and by this means entirely prevent the dropping of the cage and car down the shaft.

28. CLEANING SPINNING MULE CARRIAGE TOPS; Robert Greaves, Philadelphia, Pennsylvania.

Claim—The described mode of cleaning mule carriage tops, or any mechanical equivalent thereto.

29. WIND WHEELS; W. L. Gregory, Theresa, New York.

Claim—The arrangement of the main vane and the regulating vane, to operate in combination with the wings, as described.

30. ROCKING CARRIAGE; Albert C. Griswold, Hartford, and Walter R. Griswold, Durham, Connecticut.

Claim—The employment of the rockers, in combination with the seats or cribs. Also, the railway track or frame work with the cords or rods and springs, when used as described. Also, the employment of the elastic substance attached to the rocker, for the purpose described.

31. PADDLE-WHEEL; John W. Harris, Durhamville, New York.

Claim—Constructing paddle-wheels for boats in such a manner that the paddles may be folded laterally upon the frame, and the wheel thereby withdrawn from projecting beyond the sides of the boat, or extended at pleasure, whether the boat be in motion or at rest, the paddles being connected to the frame work, and their outer edges of the form shown.

32. ROTATING DUMPING CAR; Wm. A. Hawkes, Corinth, New York.

Claim—The arrangement and combination of the rotating platform, provided with dumping boxes, with the shaft and gearing, and the clutches, as described, so that the car may be propelled, and the dumping boxes rotated by turning shaft, as desired.

33. MATTRESS; Henry W. Henley, City of New York.

Claim—The use or employment of the serrated section, when the same shall be combined for the purpose specified.

34. HARROWS; J. Herald and C. B. Tompkins, Trumansburg, New York.

Claim—The arrangement of the plates with recesses and projections, and with a hole in their centre, for the purpose of securing the bars and the tooth, in the manner specified.

35. MACHINE FOR MOVING IRON AT THE ROLLS; Charles Hewitt, Trenton, New Jersey.

Claim—The movable floors, platforms, or supports, for moving iron or other metal at the rolls while in process of manufacture, constructed as described, or otherwise substantially the same.

36. MACHINE FOR WORKING BUTTER; Gideon Hotchkiss, Windsor, New York.

Claim—The combination of the lever stern ladle and oblong bowl, by means of the revolving joint, the projecting cope, and follower ladle, as described.

37. LOOM TEMPLES; Wm. H. Howard, Philadelphia, Pennsylvania.

Claim—The rollers twining in bearing or steps, arranged to yield independently of, and in contrary directions to, each other, on the opening of the warp threads, as set forth.

38. CONSTRUCTION OF PRISONS; Enoch Jacobs, Cincinnati, Ohio.

Claim—A secret passage or guard chamber around the outside of an iron plate jail, and between said jail and a surrounding enclosure, constructed and arranged as described.

39. MANUFACTURING KNITTED FABRICS; Joseph K. Kilbourn, Pittsfield, Massachusetts, and Edward E. Kilbourn, Litchfield, Connecticut.

Claim—The new knitted fabric described, composed of columns of stitches oblique to each other, having openings at the places where the oblique columns of stitches diverge.

40. SAW FILING MACHINE; T. E. King, West Andover, Ohio.

Claim—The suspending the file-holder upon arms, so that it is susceptible of adjustment horizontally, vertically, and obliquely, and in combination with the curved faced slot in the holder.

41. MACHINE FOR SAWING CIRCULAR BEVELS; John Lemman, Cincinnati, Ohio.

Claim—The adjustable rest hinged to the bed, in the manner described, and adjustable vertically with reference thereto.

42. BUNG CUTTER; Josiah Kirby, Cincinnati, Ohio.

Claim—The mode of pointing the lower or last end cut of the plug or bung by forcing it into a separate dog, made and used substantially as described. Also, the mode of lifting the plug out of the dog, after it has been compressed, by means of rod, G′, when operated in the manner described. Also, the mode of driving the plug out of the cutter into the compressing dog by movable rod, when operating in the manner described.

43. ADJUSTABLE HAMMER FOR REVOLVING FIRE ARMS; Alex. Le Mat, New Orleans, Louisiana.

Claim—Providing the hammer with a hinged head, so arranged that it shall present the same face in different directions, for the purpose of discharging, in succession, different barrels, or a grape shot pistol and a revolving fire arm, as may be desired, and providing the same with small lateral wings for locking the revolving chambers in position, in the manner set forth.

44. AUTOMATIC FINGER FOR CLOSING THE VENT OF CANNONS, &c.; Alex. Le Mat, New Orleans, Louisiana.

Claim—1st, The apparatus with automatic finger, substantially as described. 2d, The inclined plane, in the manner and purpose described, or as an equivalent, the inclination of the slot of the percussion lock, for the purpose set forth.

45. COMPOUND RAILROAD AXLES; H. J. Lombaert, Philadelphia, Pennsylvania.

Claim—The divided tubular axle and the solid undivided centre piece or mandrel, when the same are constructed and combined together, with each other and with the wheels, so that the said two tubular parts shall project through their respective wheels and form their journals, and also rotate out of contact and independently of each other.

46. FURNACE GRATE BARS; Warren S. Low, Albany, New York.

Claim—The combination of the corrugated and circular removable face piece with the body of a furnace grate bar, in the manner set forth.

47. SHOE SOLE; Wm. J. Lyman, East Hampton, Massachusetts.

Claim—The use, or application, or employment of metallic in-soles to shoes, boots, &c.

48. HARVESTING MACHINES; H. H. Luther, Warren, Rhode Island.

Claim—1st, Attaching the finger bar, P, to the frame, J, suspended on the shaft, K, and fitted between bars, J J, on frame, G, and arranged on shaft, H, so that the finger bar, D, and sickles may, when necessary, be elevated, and placed directly over the main wheel and shaft. 2d, Adjusting the finger bar, P, and sickles, in a more or less inclined position, in order to cut the grass or grain the desired height, by having the finger bar attached to a circular frame, G, fitted on the arm of the driving wheel, and secured at the desired point by means of the lever and projections, or any equivalent fastening. 3d, The arrangement and combination of the frames, J G, applied to the driving wheel in connexion with the gearing, respectively on the wheel, F, shafts, t t, and in the frame, J.

49. BURNISHING MOULDINGS; Robert Marcher, City of New York.

Claim—Attaching a self-adjusting burnisher to a reciprocating plate or carriage, when used in connexion with a moulding suspended and attached to the machine in the manner as shown, or in any equivalent way, to admit of being acted upon by the burnisher.

50. MACHINES FOR FINISHING BRICKS; W. S. Mayo, City of New York.

Claim—The combination of the box, plunger, and plates, with or without the feed block, substantially as set forth.

51. MANUFACTURE OF INDIA RUBBER BLANKETS OR APRONS USED IN THE PRINTING OF FABRICS, BOOKS, &c.; Charles McBurney, Boston, Massachusetts.

Claim—Bringing the blanket to a uniform thickness and smooth surface, by passing it between a revolving emery roll and a revolving feed roll, so arranged with respect to each other that the surface of the feed roll shall be ground by the emery wheel, as set forth.

52. ROTARY HARROWS; J. W. McLean, Lebanon, Indiana.

Claim—The combination of the specified obliquely set teeth, with two or more harrow frames revolving in opposite directions, as set forth.

53. SEWING MACHINES; James S. Moody, Cincinnati, Ohio.

Claim—The employment of an endless belt, arranged and operated as described, to carry one or more hooks to draw the thread through the cloth. Also, the tension collar, embracing the thread and needle, and operating to hold the thread, in the manner set forth. Also, alternately holding and releasing the double pointed needle by means of sliding keys, operating so as to pass through notches towards the ends of said needle at the proper times, arranged in the manner set forth.

54. TRUSS FOR BRIDGES, ROOFS, &c.; Samuel J. Reeves, Philadelphia, Pennsylvania, and Montgomery C. Meigs, Washington City, D. C.

Claim—The mode of trussing or stiffening a curved or arched beam or rafter for bridges or roofs, by means of tension rods or ties of metal, wood, or other suitable material, connected at their outer ends with the arched or curved beam or rafter at various points, and converging towards, and connected together at, their inner ends at a point within the space contained between the arc or arched or curved beam or rafter, and the straight line joining its extremities, substantially as described.

55. APPARATUS FOR DRYING GLUE; M. Newbauer and P. Adelman, City of New York.

Claim—The arrangement of a chamber of circular or polygonal form, which is provided with a fan blower, or its equivalent, to which air of the proper temperature is conducted by means of a pipe and tube, for the purpose of drying the cakes of glue.

56. STEAM BOILERS; Wm. Oldman, Buffalo, New York.

Claim—The central water space in the combustion chamber, arranged in relation to the annular water space, and to the tubes, or their respective equivalents, for the purpose of inducing an active circulation of the water radially among the tubes, with the advantages explained.

57. APPARATUS FOR EXHIBITING STEREOSCOPIC PICTURES; Stuart Perry, Newport, New York.

Claim—1st, A movable frame work for holding a series of stereoscopic pictures, from which the pictures are brought to be inspected, and then returned to it again by a mechanism operated by the user. 2d, Bringing each individual picture or pair of pictures, in succession, to the same point or place, before they are projected from their compartments to be exhibited, by mechanism. 3d, In combination with a movable picture-holder, a reciprocating carrying frame, that catches each picture or pair of pictures, in succession, and carries them to the place where they are to be inspected, and returns them to their compartment again. 4th, In combination with a box or case containing within it a series of pictures and a mechanism for projecting them from said case, a frame work on the outside of said box or case for receiving said picture. 5th, The slots in the picture-holder barrier and in the box or case, so that the picture, from its compartments in the picture-holder, may be projected through both slots or openings to the outside of the box. 6th, The friction brake, or its equivalent, for holding the picture-holder and prevent it from moving until started by the crank. 7th, Making the frame in sections or with an opening, for the purpose of introducing the pictures through said frame into the compartments of the picture-holder as well as removing them therefrom. 8th, The clamps, as applied to single or double pictures, for the purpose of strengthening them, preventing their warping or bending, and thus facilitating their passage through the slot, which they must pass through, to the place where they are exhibited.

58. MACHINERY FOR DRYING PAPER; Edward L. Perkins, Roxbury, Massachusetts.

Claim—Feeding the paper from a roll outside of the drying chamber, through proper openings, to a series of rollers, and then conducting it over said rollers vertically through the apparatus, and subjecting it, during its passage, to a gentle current of heated air, produced by forming inlets at the bottom for the reception of the atmospheric air, which passes up and is heated by a suitable heating apparatus, and escapes readily through apertures at the top, and then out of the drying chamber through proper openings to a receiving roller.

59. TAIL PIECES FOR VIOLINS; John Pfaff, Philadelphia, Pennsylvania.

Claim—The metal tail pieces with an eye adapted to the detachable pin, recesses for the reception of the strings, and with the rib, as set forth.

60. CUTTING OUT STRAP HINGES; Samuel M. Richardson, City of New York.

Claim—The relieving die, in combination with the shaping die and cutter, in the manner specified.

61. DUST-PAN; J. Hall Rohrman, Philadelphia, Pennsylvania.

Claim—A dust-pan, having its bottom corrugated and its back edge seamed over, for the purposes of making the bottom of the pan rigid without extending any brace from the handle, and rendering unnecessary the wiring of the back edge of the pan.

62. FURNACES AND STOVES; Charles B. Sawyer, Fitchburg, Massachusetts.

Claim—1st, The arrangement of the closed-topped fire-pots, gas or combustion chamber, fire or draft flues, small gas openings, and air heating flues, in relation to each other. 2d, The arrangement of the horizontal ventilating flue, ventilating chamber, and exit ventilating flue, and right-angled draft flue, in relation to each other and in the top of the furnace.

63. SPRING BEDSTEAD BOTTOMS; George Schott and John Loudon, City of New York.

Claim—The arrangement of the eyes, elastic cord or strap, and hooks, on the ends of the slats. Also, the studs, constructed and acting to sustain the slats on the strap or elastic cord.

64. GRINDING MILLS; Joseph Sedgebeer, Cincinnati, Ohio.

Claim—1st. Constructing the rotating plate with the same dress or finish upon its grinding face as that of the stationary plate. 2d, The diamond-shaped teeth, arranged as set forth.

65. MEANS OF SECURING THE BITS OF BENCH PLANES; Charles W. Seely and Benjamin F. Locke, Wellington, Ohio.

Claim—Stopping the upper end of the interposed bit below the screw, and upsetting it so as to catch into the cross serrations in the bed-piece.

66. MODE OF SWITCHING OFF RAILROAD CARS FROM ONE TRACK TO ANOTHER; M. Semple, Philadelphia, Pa.

Claim—The immovable switch or turnout, in combination with the guide bars, when arranged as described.

67. MACHINE FOR RAISING WATER; Peter Shank, Jefferson Township, Ohio.

Claim—The combination of the horizontal float wheel, the crank motion (as produced by the three pins) which gives six motions of the pump to one revolution of the wheel, and the horizontal double pump.

68. OPERATING MACHINERY BY DOG POWER; Dexter C. Slater, Lawrence, New York.

Claim—The arrangement and combination of the wheel, shaft, cam, and lever, as set forth.

69. CHEESE-CUTTERS; De Witt Stevens, Newark, New Jersey.

Claim—1st, The arrangement of the platform with the projecting rings, to operate in combination with the corrugated cutting edge of the knife. 2d, The arc, arranged in combination with the platform, with the handle, and with the knife, so that the cheese on the platform can be cut up in slices of any given

weight. 3d, The arrangement and combination of the lever, the link, and the slide, for the purpose of operating the knife.

70. Rocking Cradle; W. D. Tewksbury, Cuylersville, New York.

Claim—The two escapement wheels, arranged in combination with the verge and with the arm, in the manner described.

71. Method of Printing Bank Notes; Alfred Tichenor, Newark, New Jersey.

Claim—1st, The making bank notes, and other engraved plates or sections of plates, with tongue and groove or dowel joints. 2d, The locking together tongue and grooved bank note or other engraved plates, by a chase, having it formed with tongue or groove, or with dowels made to match or correspond to the ends and sides of the tongue and grooved plate, which chase is made in pieces, fitted together and furnished with set-screws, as described.

72. Bee-hives; Ruggles S. Torrey, Bangor, Maine.

Claim—Providing the troughs in the tops of the comb-bars, arranged with the series of conducting tubes for conveying the feed to the troughs, and with apertures or slots for the free exit of the moisture to the condenser.

73. Brick Machine; William S. Watson, Madison, Indiana.

Claim—1st, The combination and arrangement with a stationary pressing block of an intermittently reciprocating press-box, formed with one or more chambers, and provided with one or more plungers, having a joint motion with the press-box, and an independent movement thereto. 2d, The combination with the intermittently reciprocating press-box, of the top and bottom holding slides, or either of them, arranged to move conjointly with the press-box, and independently of it. 3d, Mounting the intermittently reciprocating press-box with a feed-box, having one or more chambers.

74. Machine for Finishing Leather; T. F. Weston, Salem, Massachusetts.

Claim—1st, The combination and arrangement of the devices herein described, or their mechanical equivalents, for changing the angle of the tool while the machine is in motion, so as to cause it to operate upon the latter. first with a sharp edge, to take out its inequalities, and then with a dull or blunt edge, to smooth the leather, the successive operations producing the peculiar effect desired. 2d, The arrangement of devices herein described, for giving positive motions to the tool, for lifting it from, and holding it down upon, the bed, the same consisting of the sliding bar and friction box.

75. Omnibus Register; Robert F. White, City of New York.

Claim—The spring platform, arranged in combination with the hammer, and with the index, and operated by the lever, or its equivalent, in the manner specified.

76. Lock Attachment; John M. Wilson, Philadelphia, Pennsylvania.

Claim—The arrangement, in combination with a lock and door of the box, key-holes, wards, guard, plate, pivoted stops, and springs, arranged in the manner set forth.

77. Washing Machine; Samuel Wiswall, Hyde Park, Vermont.

Claim—The arrangement and combination, within the oscillating cylinder of a receiving chamber, having plates and a door, when said door is corrugated on one side and hinged to one of the plates, so that said door may serve as a rubbing board, and also as a presser.

78. Cultivators; John Young, Joliet, Illinois.

Claim—1st, The combination of the screw extension on the bottom of the standard, with the oblique slotted castings attached to the front side of the cross-bar of the beam. 2d, The combination of the stationary vertically perforated bar with the adjustable rake or harrow arranged on a cultivator, as set forth.

79. Burglars' Alarm Pistol; John G. Clark, Assignor to self, D. G. Cotting, and Samuel W. Hatch, Augusta, Georgia.

Claim—1st, A pistol, arranged on a vertical suspension guide of a hammer, so that the explosion of its cap and the firing of its charges may be accomplished by concussions of the pistol and hammer. 2d, Holding the pistol suspended by the means and in the particular manner described.

80. Machines for Tempering Clay; J. D. Custer, Norristown, Pennsylvania, Assignor to self and J. M. Roberts, Perth Amboy, New Jersey.

Claim—The arrangement and combination of the stationary toothed rim encompassing the pit, the frame, with the gearing attached to its outer ends, the pinion of the shaft, N, gearing into the rim, and the rod or shaft, F, connected with the frame, the hollow shaft, g, on the shaft, B, and the belt passing around the pulleys, as set forth.

81. Steering Apparatus; Wm. Goodsoe, Assignor to self and Isaac Ayres, Manchester Massachusetts.

Claim—The combination of the toothed segment and the curved way, operating as set forth.

82. Stoves; C. Harris and Paul W. Zoiner, Assignors to selves and J. Langstaff, Cincinnati, Ohio.

Claim—The arrangement and combination of the damper, chamber, double-walled case, and pipe, so that the damper which pertains to the oven shall, when drawn out, extend across the bottom of the pipe, and cause the products of combustion to circulate as described, and when closed shall permit a more direct draft.

83. Apparatus for Heating Water; George L. Ingersoll, Assignor to J. E. Ingersoll, Cleveland, Ohio.

Claim—The double cylinder heater, the same being united by the plates so as to form the space for the ascension of the heat, and by the pieces, D E, for the passage of the water, the heating space being covered by the cap, and the parts here named being arranged as set forth. Also, in combination with the two cylinders, the ingress pipe, extending to near the bottom of the cylinder, the exit pipe, and the pipe, in connexion with the pipes, D E, for the purpose of establishing a circulation and rapid heating of the water.

84. Shoe-knives; Ira Merritt, Abington, Assignor to self and L. S. Merritt, Weymouth, Massachusetts.

Claim—The described knife-holder, in combination with an extensible blade, so arranged that as the blade is worn it may be protruded.

85. Spirit Gas Burners; Charles Miller, Assignor to Henry Danford, St. Louis, Missouri.

Claim—The arrangement of the valve over the tube and wick, for the purpose of extinguishing the flame, or regulating its size and altering its direction.

86. Diaphragm for Photographic Cameras; Felix Miller and Alois Wirsching, Assignors to Felix Miller and H. H. Hayden, City of New York.

Claim—The arrangement and combination of the plates, the notched plate, and springs, as described.

[A number of curved plates are placed in a tube in front of the lens, so as to form apertures of different sizes for increasing or diminishing the intensity or sharpness of the light into the camera from the object, in taking photographic pictures.]

87. Power Printing Presses; Jedediah Morse, Canton, Assignor to the S. P. Ruggles Power Press Manufacturing Company, Boston, Massachusetts.

Claim—The improvement in the construction of each of the platen rails, the same consisting in the chute and a notch or depression arranged therein, and with reference to the rollers or tapes, in manner as specified. Also, the arrangement and combination of the slider with the operating cam and the pin or stud on the rocker toggle, such slider being actuated by a foot-treadle, a spring, and the cam of the toggle. Also, the mode of insuring the return movement of the toggles, and their gradual forward motion, after each impression has taken place, the same being accomplished by the notched wheel or its notch. Also, the mode of constructing the gears for operating the frisket-carrier, viz: with the toothed arcs, and the concave and convex arcs, unprovided with teeth. I do not claim the subject of the United States patent No. 7205—but I claim the combination of the two, or any other suitable number of wheels, lever nippers (applied respectively to them), and their opening and closing bars, or mechanical equivalents for such bars. Also, the specified mode of constructing each of the nippers for receiving the sheet of paper from the table, viz: so that each jaw may move away from the other while the upper is being raised, the same producing the advantages not only of insuring the passage of the lower jaw underneath the sheet of paper simultaneously with that of the other jaw over it, but of both jaws closing upon the paper at one and the same time, so as not to lift it out of place. Also, the mode of constructing the lower jaw of each pair of nippers, viz: with a lip or bend arranged thereon. Also, the mode of applying and operating each of the points, viz: hinging or jointing it to the table, and combining with it a stop and lever, or the equivalents therefor. Also, the improved method of operating the frisket-carrier, the same consisting in causing it to descend and pass in an inclined position under the delivering tapes and rollers, while the nippers may be approaching the sheet table, the same enabling the press to be made lower and shorter than when the frisket-carriage is moved horizontally under the said delivering tapes or rollers.

88. Machinery for Cutting Comb Teeth; Wm. Noyes, Jr., West Newbury, Assignor to S. C. Noyes & Co., West Roxbury, Massachusetts.

Claim—In combination with the saw, or the same and its peripheral guide or guides, a mechanism or means of pressing or bending the saw laterally. Also, the mode of producing the lateral and longitudinal movements of the carriage of the comb-carrier, viz: by means of the cam and its screw-thread periphery, arranged and operating in conjunction with a rack applied to the said carriage, as described.

89. Machine for Converting Oscillating Motion into Direct Circular Motion; Louis Planer, Assignor to self and Joseph Auger, City of New York.

Claim—The grooved dog having its tail resting in a recess, or equivalent resting place, in the lever, without being pivoted, or otherwise attached thereto, and having a spring applied in combination with it and the said lever, and the whole being applied and combined with the wheel and its axle, as described.

90. Hooks for Vest Chains; Anthony Wallach, Assignor to self and Adolph Wallach, City of New York.

Claim—The clasping hook, in combination with the bolt in the body of the vest chain hook.

91. Moulds for Pressing Glass; Thomas Shaw, Assignor to self and John C. Bailey, Philadelphia, Penna.

Claim—Forming on the plunger a shoulder of a size corresponding to that of the upper edge of the recess in the base of the mould, and limiting the downward movement of the plunger, so that the said shoulder shall coincide or be slightly below the said upper edge of the recess.

92. Plug Bedstead Fastening; Jacob J. Smith, Assignor to self and J. H. Pugh, Philadelphia, Penna.

Claim—1st, A double plug fastening for bedsteads, consisting of the two distinct parts, so constructed as to be adapted for being driven or secured into the post and rail respectively, and also fitted with a wedge-shaped dovetail tenon, and a corresponding groove, operating together so as to cause the end of the rail to be drawn tightly against the post, in the downward pressure of the said rail, after they are connected together. 2d, Making the post-plug with the inclined dovetail groove across in one side of the same, so as to operate in combination with the wedge-shaped tenon on the rail-plug.

MECHANICS, PHYSICS, AND CHEMISTRY.

*Note as to the Relation of Common and Voltaic Electricity.**

By J. J. Waterston, Esq.

In the seventh series of his "Experimental Researches," Faraday treats of the absolute quantity of electricity associated with the atoms of matter, and sums up with a statement as to the quantity of electricity associated with the chemical elements of a grain of water, which has often been quoted since in a way that tends to mislead as to the potential magnitude of the forces involved. There is an example of this in the last (January) number of the *Edinburgh Review*, p. 235, where the following passage occurs:—"Yet they find authority in the mar-

* From the Lond., Edin., and Dub. Philosophical Mag., May, 1859.

vellous fact, well authenticated by Faraday, that one drop of water contains, and may be made to evolve, as much electricity as under other manner of evolution *would suffice to produce a thunder-storm.*" The mechanical value of the chemical force that unites the oxygen to the hydrogen of a grain of water is well known to be about equal to the weight of 7 cwt. exerted through one foot. That such amount of force would *suffice* to produce a thunder-storm is plainly an idea that cannot be entertained ; nor is it strictly implied by the words of Faraday, which are—" The chemical action of a grain of water upon four grains of zinc can evolve electricity equal in quantity to that of a powerful thunder-storm." This was written in 1833, when the application of a mechanical standard or work equivalent to molecular forces was but little thought of. To avoid conveying an incorrect impression now, it would be necessary to underline the word " quantity," and add, " but of *incomparably less intensity* than that of a powerful thunder-storm." The idea of the mechanical equivalent of a grain of water being equal to the mechanical equivalent of a thunder-storm would thus be excluded.

The progress of science, and the labors of Harris especially, has since enabled us to obtain some clearer ideas of quantity and intensity as applied to electricity. When the mechanical value of a constant quantity under different degrees of intensity has been ascertained—and this seems practicable with Harris' apparatus—we shall be in a position to estimate exactly the potential relation between voltaic and common eletricity. In the mean time it may be useful to direct attention to certain data which already exist, by means of which we may roughly calculate an approximate result.

The great electric battery of the celebrated Dutch electrician, Van Merum, consisted of 100 jars, each exposing $5\frac{1}{2}$ square feet of coated glass, making altogether 550 square feet. It is stated that this battery, discharged through a length of 25 feet of iron wire $\frac{1}{140}$th of an inch in diameter, fused it so that it was converted into red-hot balls thrown in all directions. Assuming that the heat evolved was sufficient to raise the temperature of the wire 3000 degrees, we have $\frac{1}{52}$ of a cubic inch of iron thus heated ; this is equivalent to about $\frac{1}{58}$ cubic inch of water raised 3000 degrees, or 15,000 grains raised 1 degree.

To compare this battery strictly with that employed by Faraday, we should require to know the electric tension of each when charged, as indicated by the same electrometer; also the thickness of the glass in each. Such data are wanting ; but, for a rough estimate, we may perhaps assume that they did not differ materially in these particulars.

Faraday states that the quantity of electricity required to decompose a single grain of water is equal to 800,000 charges of a 25 square feet battery, each charge made by thirty turns of a plate-glass machine, 50 inches diameter, in full action. The product of 25 by 800,000 is 20,000,000 square feet of coated glass. This, compared with 550, shows that the quantity of electricity associated with 1 grain of water is upwards of 36,000 times the amount in Van Merum's battery,

and consequently the heating power must be equivalent to 15,000 grains of water raised 36,000 degrees.

According to the experiments of MM. Dulong and Hess, 1 litre, or 61 cubic inches of hydrogen, burned in half a litre of oxygen, gives out heat sufficient to raise 3102 grms. of water 1° C., or 12·3 lbs. 1° F. The water formed by the combustion is 0·00168 lbs. The ratio this bears to 12·3 lbs. is 1 to 7345; so that the heat given out by the combustion of hydrogen sufficient to form 1 grain of water, would raise 7345 grains of water 1° F. in temperature. Comparing this with 15,000 grains raised 36,000 degrees, we arrive at the conclusion that the mechanical value of the electricity required to decompose 1 grain of water is less than $\frac{1}{70,000}$th of the mechanical value of the electricity in the 800,000 charges of the 25-feet battery. Thus eleven charges of this battery represent the integral electric force contained in 1 grain of water.

Edinburgh, February 13, 1859.

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*Durability of Electrotype Work.** By Edward Richardson.

In reply to an inquiry made at the Institute of Architects, as to the probable durability of electrotype metal, and its thickness, and for the information of your general readers, I may state that in 1844, being called upon to furnish metal medallions, &c., for the granite testimonial to Major-General Sir Alexander Dickson, K.C.B., &c., near the Rotunda, on Woolwich-common, a very exposed situation, I suggested electrotype castings. A consultation of officers on the question followed, the results being, full permission to reproduce my models in electrotype copper, which was ably carried out in the depth of a severe winter for me, by Mr. Henry Cox, at Battersea, now local manager of the Lizard Serpentine Company. These castings were at that time of unusual size and thickness, viz: 2 feet 6 inches diameter, and fully an eighth of an inch thick of solid metal. This was effected also without shrinking, and every tool touch from the clay model was reproduced. These works have been now exposed for 15 years; and I believe that 500 will give no perceptible change in them. They weighed, as far as I can remember, thirty pounds each. No chasing was required. Mr. Cox, who, if he sees this, may speak for himself, afterwards executed much more extensive works for the Prince Consort, at Windsor, and other patrons.

On the other hand, I have had, for years, a small brass, about fifteen inches high, of my Templar, William, Earl of Pembroke, produced by the old fire process, which cost me pounds to chase, obliterating every line of my original model, and weighs nearly $\frac{1}{4}$ of a cwt. When are we to rival our foreign neighbors in this important branch? The zinc Berlin process seems forgotton.

* From the Lond. Builder, No. 845.

*On Professor Hughes' System of Type-printing Telegraphs and Methods of Insulation, with special reference to Submarine Cables.** By Mr. H. Hyde.

(Continued from page 51.)

Discussion.—The CHAIRMAN said, in inviting discussion and further inquiry into this interesting subject, he would call the attention of the meeting to one or two points which he thought worthy of observation. The idea of the introduction of this self-curing material was perfectly original, and, as an invention, was very beautiful; but practical men would require it to be put to a very severe test before they adopted it. He believed it to be quite within the range of possibility to introduce a sufficient quantity of that viscid material into a telegraph cable, to effect the purpose which they had seen illustrated upon a small scale that evening, in a manner that must have been highly satisfactory to all present. If a fracture took place in the gutta percha covering at the bottom of the ocean, the cure would be effected without the fact of the rupture ever being known, as it would immediately heal itself. The novelty of this discovery, and its application to such a purpose, was highly honorable to Professor Hughes. They must take it for granted that this semi-fluid was a good insulator; and, as it had the property of hardening upon coming into contact with the water, it was likely to become a most valuable adjunct to gutta percha, which was of a porous nature, and liable to injury from fractures. He also thought the invention would be very valuable as applied to the street wires of electric telegraphs, and these afforded great facilities for testing its value. The mode adopted by Professor Hughes for obtaining synchronism in his instrument was very beautiful and novel. Previous attempts in this direction, though repeatedly made, had hitherto not succeeded. With regard to the rapidity with which the signals could be recorded, it was stated in the paper that the Trans-Atlantic intelligence was conveyed between Boston and New York at the rate of from 2000 to 2500 unabbreviated words per hour, which was equal to about 40 words per minute. There was a point upon which it would be interesting to have some information. It was stated that any number of instruments could be used in the circuit, and that there was the power of cutting off the communication from all the instruments, except the one which was being addressed. Supposing the instruments at the two extremities of the circuit to be in communication; for a moment the intermediate circuit would be interrupted. Was there any movement which indicated to the clerks at the intermediate instruments, the fact that signals were passing through the entire circuit, and must not be disturbed?

Professor HUGHES replied that that was so, and there was no fear of interruption from the intermediate instruments.

Mr. WM. SMITH thought the experiments which Professor Hughes had shown of the restoration of the insulation should be tested under pressure; for, after all, the main question was to ascertain how it

* From the Journal of the Society of Arts, No. 334.

would behave under the pressure that was due to the depth of the ocean in which the cable was submerged. This might be done in a closed vessel with a force-pump. He thought there was no difficulty in producing a semi-fluid substance which would become solidified by the action of water; but the question was whether, if they covered the wire with this preparation, and then cut through the gutta percha, the pressure would not force the material through the opening and prevent its acting.

The Rev. Walter Mitchell had had the advantage of seeing this experiment tried in private, where it could be conducted with greater care and accuracy than in a public room, and the results were highly satisfactory.

Mr. Wm. Newton begged to ask whether there was any objection to stating what the nature of this viscid composition was? It would be interesting to the members to know.

Mr. Hyde replied that it would afford him great pleasure to furnish as much information as possible on this subject; but in almost every invention there were certain things which it was expedient to keep to themselves. He would add, with reference to these instruments generally, that there were many things which he might communicate if he could do so in justice to the rights and claims of the inventor. Unfortunately, people did not recognise, as he thought they ought to do, the rights of property in inventions, and for that reason inventors were obliged to keep some things to themselves.

Mr. Newton added that Professor Hughes had protected his invention by letters patent; and in his specification he was bound to state, not only in what the invention consisted, but also the means by which he proposed to carry it into effect; and when the specification was enrolled, the inventor must give the full details of it. He would say with regard to this insulation, it had been known for some time in the United States, and he had seen observations in the public prints detracting from its merits. He alluded to that in order to observe that, as far as he could judge, those statements were erroneous, and instead of the invention being valueless, it had been properly designated as an exceedingly ingenious mode of insulating the electric conductor. He agreed with the opinion expressed that it was advisable to make experiments in order to ascertain the manner in which this insulating compound would act under considerable pressure. With regard to the Atlantic cable, he had never had any confidence in it. It appeared to him that any metallic coating on the outside must have some effect upon the conductor inside, especially when the conductor was only protected—as in the case of the Atlantic cable—by an imperfect insulator like gutta percha. Mr. Hyde had stated that gutta percha was a good insulator—a remark which he (Mr. Newton) was surprised to hear from one so well qualified to judge of these matters, because it was generally conceded that gutta percha was only a moderately good insulator. India rubber was much better than gutta percha, which had the peculiar property of becoming charged with electricity after it had been used as an insulator for any length of

time, and was therefore likely to induce leakage. He could mention one or two other modes of insulation which he considered preferable to that of gutta percha, and particularly he would notice the invention of Captains Drayson and Binney, of the Royal Engineers. They proposed, instead of a strand of seven wires, to have a single large conductor, and to cover that with a solution of india rubber paid round with silk, or some other non-conducting substance, and to inclose the whole in a vulcanized india rubber tube which contained a column of air. In a conductor upon that principle they had, in the first place, the insulation of the india rubber; secondly, the insulation of the silk; thirdly, that of the air; and, finally, that of the outer india rubber tube. This appeared to him to form a perfect insulator of the electric wire. There were other insulating compositions which had come under his notice professionally, one of which was that of Mr. Leonard Wray, who proposed to make a composition formed of india rubber or gutta percha, mixed with silicious matter, and a resinous substance such as shell-lac. This appeared to him to contain all the elements of a good insulator. He was not, however, aware that this plan had been tested to any great extent. Another method had been introduced by Mr. McIntosh, but he did not consider it so practical as the others to which he had alluded.

Mr. Hobbs remarked that there was novelty in the idea of the material being forced out by the pressure of the water, as stated by some of the speakers. If there was a hole through the gutta percha, he apprehended the pressure on the hole would be the same as the pressure on any portion of the cable, and he could not conceive how, under such circumstances, the semi-fluid matter was to be forced out.

Mr. Newton would add, with reference to the remarks of the chairman, that this plan would be applicable to underground telegraph wires—that it appeared to him (Mr. Newton,) to require the action of water to solidify the viscid fluid, and, as far as he understood, it would not harden by simple exposure to the air.

The Chairman replied that a simple wound in the gutta percha covering would not be injurious to insulation in a land telegraph wire. The injurious effect would only take place in the event of water getting into the pipe. The moment the wound in the gutta percha rendered the insulation imperfect, the water would have the effect of healing the wound by its action on the viscid fluid.

Mr. Thos. Winkworth would take the liberty of asking one or two questions. Should any fractures occur in the cable, what provision was made for the fresh supply of the semi-viscid fluid which exuded or oozed out?

The Chairman.—When it is exhausted you cannot put in a fresh supply.

Professor Hughes explained that there would be no more fluid exuded than was sufficient to fill up the space which was cut out. If they cut the gutta percha in the open air, no more fluid would ooze out than would be enough to fill the space, and therefore the quantity in the tube would be sufficient to fill up an innumerable number of small fractures.

The CHAIRMAN—Does the fluid harden by exposure to the air?

Professor HUGHES—No; but it could be easily made to do so.

The CHAIRMAN was still of opinion that it would be valuable as applied to land telegraph communication. He would inquire whether the application of the semi-fluid matter was very expensive?

Professor HUGHES replied that the cost was something below that of gutta percha. It could be placed within two coatings, or between the wire and the single outer coating.

Mr. HOBBS would ask what effect time would have upon this material? The substance might be very good when first applied, but in time its properties might be destroyed.

Mr. HYDE replied that time must answer that question. He was not able to do so at present.

Professor HUGHES said it had been tried under water for three months, and had been exposed to the atmosphere for six months, without any change whatever having taken place. It was not injured by the action of the atmosphere.

Mr. WINKWORTH would further inquire whether the printing instrument was in practical use for any great length of land wire, and on what length of circuits it had been worked?

Professor HUGHES said it was in practical use in the United States on six telegraphic lines when he left America, and that it had been worked over a circuit of 600 miles without relay. The right to use the instrument had been purchased by companies possessing 30,000 miles of telegraph in America.

Mr. WINKWORTH would like to be informed whether the instrument had been tried upon submarine wires; and if so, to what extent in length, and with what rapidity?

Professor HUGHES said it had been worked upon the Atlantic cable while coiled at Keyham, and also upon the Red Sea and Australian cables, through their entire length.

The CHAIRMAN inquired whether those experiments had taken place in the presence of witnesses.

Professor HUGHES said they were witnessed by several persons.

The CHAIRMAN added that it was satisfactory that Professor Hughes was able to state that the experiments were witnessed by several persons, as he was not aware that that fact had ever before been published. It was gratifying to know that messages were passed through the entire distance.

Mr. HYDE stated that the experiments were continued for several weeks during the shipping of the Atlantic cable at Keyham, in May last. The transmission of messages through the Atlantic cable was at that time slow, and at a much less rate than the instrument would be capable of accomplishing at the present time. Professor Hughes had made no experiments upon long submarine lines until he came to this country, and the first experiments were made upon the Atlantic cable. The instruments were timing instruments, and the rate of speed must be proportioned to the rate at which the electric wave would travel through the wire. When he was in America, he learnt from the elec-

trician's report to the Company that the rate at which the electric wave would travel through the Atlantic cable was equal to four words per minute with the ordinary Morse relay. The instrument of Professor Hughes, intended for land lines, would not move correctly at this slow rate, and therefore instruments were specially made with a minimum rate of speed of four words per minute, in accordance with the electrician's report. When Professor Hughes arrived at Keyham, he found that the rate at which signals could be transmitted through the Atlantic cable was less than had been stated in the report, and the instrument was not adapted to so slow a motion. After reducing it by temporary arrangements, he was able to transmit letters at the rate of two and a half words per minute. This was done in the presence of Mr. Field, the managing director, and some half-dozen other persons. Since that time the instrument had been tried upon the Tasmanian cable, 240 miles in length, and through that they worked 25 words per minute. Subsequently, experiments were made upon the Red Sea Cable, 1780 nautical miles in length, or nearly 2000 statute miles. Upon that cable they worked with perfect success, day after day, for a week, first upon 500 miles, then upon 800, then upon 1500, and finally upon the whole length of 2000 miles. The rate of speed through the entire length was between four and six words per minute. The rate over 1000 miles was from eight to ten words per minute; through 500 miles it was twenty words per minute. With reference to the semi-fluid substance, he had no desire to keep back any useful information, but they had been trying experiments for four months, in order to ascertain what combination of materials was best adapted for the purpose. Mr. Newton had referred to a cable constructed with a long tube filled with air as a non-conducting element. It appeared to him (Mr. Hyde) that as an insulator, the air would be far inferior to the fluid substance, or even to gutta percha. He also thought that if any fracture occurred in the coating, the pressure upon it would be such that the air would be displaced by the water. On the other hand, Professor Hughes had been seeking and had obtained a semi-fluid substance, every portion of the ingredients of which would be heavier than water. He would say with reference to the semi-fluid substance, that almost anything would make a semi-fluid substance. The question was—what was the best material? and this he did not feel disposed at present to develop. He would only say that ordinary oil or hydro carbons mixed with resinous substances would produce such a semi-fluid substance as would restore insulation. The merit of the invention consisted in the idea of the use of a semi-fluid material for this purpose, and not so much in the material used. Mr. Smith had suggested that means should be taken to test the action of this material under heavy pressure. His (Mr. Hyde's) impression always had been that the pressure would be equal upon all parts of a submerged cable, and therefore the fluid would be in the same position under a pressure of two miles depth of water as under two feet in a bath. They had, however, gone almost to the extent proposed by Mr. Smith. They had made the experiment with a pressure equal to

that of 3000 fathoms, or two miles, with perfect success, with the gutta percha incised before it was submerged. In one case the gutta percha was split from end to end and it came out perfect.

Mr. Bevan referred to the recent experiments upon insulation made at the works of Messrs. Silver & Co., at North Woolwich. As far as he understood it, the insulation was effected by india rubber, and if a puncture occurred in the tube it would by the pressure be healed. Some credit was therefore due to the plan as being prior to that of Professor Hughes.

Mr. Newton said experiments as to the effect of pressure had been tried with the cable as designed by Captain Drayson, and it was found that with a pressure exceeding that of two miles below the surface, a puncture being made in the tube, the air was not expelled from it. In the case of a small fracture, such as a crack, it did not appear that the air escaped even when under hydraulic pressure.

Mr. Hyde was very glad to hear it; he thanked Mr. Newton for having mentioned the different modes of insulation that had come under his notice. He (Mr. Hyde), however, was not there for the purpose of criticising the inventions of others, but to illustrate and defend those of Professor Hughes.

Mr. Smith said the question was, whether the material would exude from the tube, when cut whilst under pressure; he knew that in some experiments that were tried the fluid did exude. The cut was made whilst under pressure, and there was no balancing of the forces until some of the fluid had exuded, and some alteration in the dimensions had taken place.

Mr. Tuckett submitted that upon the principle of hydraulic pressure, if the surface of the whole tube were greater than the surface which was not protected, the pressure being in proportion to the area, there must be exudation, and there would be a tendency to press the liquid out of the hole.

Mr. J. G. Appold, F. R. S., said, experiments showed that there was no exudation. It made no difference whether it was under pressure or otherwise.

Mr. Hyde, to meet the hydraulic point that had been raised, would ask whether the pressure upon each point would not be the same? To get the fluid to ooze out, they must have a point free from pressure. The pressure was equal on all parts of the cable.

The Chairman said, this point had been proved by experiment.

Professor Hughes remarked that the fluid, being heavier than water, was not displaced by the water.

The Chairman would wind up this discussion with a few observations, one being not so much applicable to telegraphic communication as to the objects and action of this society. When he first joined the Society, about 24 years ago, before the revolution in its operations took place—for it was more than a reformation—no patent scheme could be brought before the Society. It must have been an invention thrown open to the world. The revolution to which he had alluded, brought about a great change in this respect; and he thought one of

the greatest boons the society now conferred, was the encouragement it gave to patentees to come with their inventions as soon as they were in a condition to do so, and allow them, as had been done by Professor Hughes and Mr. Hyde that night, to give them such information as they could, without injury to their interests. Mr. Newton had a perfect right to ask for the information he was desirous to obtain; but, at the same time, there was no improper selfishness in Mr. Hyde refusing to communicate it; he had a perfect right, if he chose, to keep the secret to himself. The application of india rubber for the purpose of insulation was not new; it had been used in single, double, and treble coats for the last 20 years. The great improvement consisted in thoroughly uniting the edges of the india rubber by means which could not injure it in its non-conducting character, or lead to the ultimate decomposition of the material itself. The solutions formerly employed for the purpose were injurious to it; and he was happy to say there were two or three plans then under consideration which gave good promise of success. These, however, had nothing to do with the beautiful idea of placing within the gutta percha a material capable of healing those wounds which arose from the defects existing more or less in all impure gutta percha—such as air bubbles, small particles of fibres, or wood, or indeed from any defect whatever. He was sure he was only expressing the feelings of the meeting in proposing a vote of thanks to Mr. Hyde for the paper he had read, and also to Professor Hughes for the illustrations he had given of his beautiful apparatus, and the explanations he had afforded upon this very interesting subject.

A vote of thanks was then passed to Mr. Hyde and Prof. Hughes.

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*Coal as an Aid to Industrial Progress.**

Questions of high economical value arise out of the possible development of the great coal fields of the United States, which comprise no less than 196,850 square miles—added to which the British provinces contain 7530 square miles. These coal areas are amazing and may be productive of immense commercial results in the far future. When we reflect upon what has been acheived by the produce of the coal fields of Britain, mere specks compared with those of the United States, and in figures amounting only to 5400 square miles,—when we further consider the total coal fields of Europe, and find them only 8964 square miles—and then endeavor to anticipate the mining of the enormous fields of the United States upon an extensive scale, we are led to forecast a future of almost boundless enterprise for that wonderful country. An estimate of the probable produce of the American coal fields may be formed from some data afforded in an excellent work just published by Prof. Rogers, on the Geology of Pennsylvania. Averaging the total thickness of the workable coal in Great Britain at 35 ft., we have a total of workable coal equal to 190,000,000,000

* From the Lond. Mining Journal, No. 1230.

tons. In the same way, estimating the total area of the *productive* coal fields of North America as 200,000 square miles (that is inclusive of the British provinces) and averaging the thickness of good workable coal at 20 ft., a result of 4,000,000,000,000 tons is gained, Or, to make these results more appreciable, if we take the amount of workable coal in Belgium as 1, then that in all the British Islands is rather more than 5, that in all Europe $8\frac{3}{4}$, and that in all the coal fields of North America is 111. This method of ratio is more intelligible than that of relative superficial magnitudes—and we at once perceive that the United States possess more than twenty-two times our amount of coal. We apprehend, however, when mining discovers more fully the character of the American coal, that the superiority of our best bituminous coal will in a large measure compensate for our smaller quantity.

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*On the Practical Bearing of the Theory of Electricity in Submarine Telegraphy, the Electrical Difficulties in Long Circuits, and the Conditions requisite in a Cable to insure rapid and certain communication.** By S. Alfred Varley, Assoc. Inst. C. E.

(Continued from page 61.)

The correctness of considering the inductive phenomena which manifest themselves in subterranean and submarine circuits, as a new fact suddenly brought to light, has been called in question in the early portion of this paper; a few words on its history will therefore not be out of place, before considering the way in which it affects telegraphing.

In 1838, Dr. Faraday pointed out the conditions which would cause the retardation of an electric impulse in its passage through a conductor.

In 1848, the electric telegraph was in actual operation. The method adopted at that time for the insulation of the wires passing through towns, was to enclose a number of cotton covered wires in a leaden tube, and then fill the tube with a mixture of resin and Stockholm tar.

Reasoning on Dr. Faraday's observations, my brother, Cromwell Varley, was led to think that such circuits possessed conditions favorable for induction to manifest itself; he therefore searched for it, and succeeded in obtaining indications of induction.

In 1849, gutta percha had been introduced, and as the insulation in gutta percha covered wires was much more perfect than in the cotton covered ones enclosed in leaden pipes, induction manifested itself much more strikingly, and my brother made use of, from that time as a more searching test of perfection of the insulation than the deflection of a galvanometer, the capability of the wire to retain for a certain period the induced charge, and he stood alone for some time in making use of this test, others not having faith in it at that period, and in the same year he obtained indications of induction in an overground circuit.

In the latter end of the year 1851, my brother was enabled to experiment upon a length of ten miles of gutta percha covered wire.

* From the Jour. of the Society of Arts, No. 332.

At these experiments I assisted, and the conclusion he arrived at was, that if gutta percha covered wires were employed for circuits of any length, as was at that time proposed, induction would manifest itself so powerfully, as to offer serious obstacles to telegraphing with the apparatus then in use, the truth of which prediction was subsequently verified. In Prussia, however, as early as 1850, Mr. W. Siemens had employed gutta percha covered wires for circuits of considerable lengths, and encountered the inductive phenomena, an account of which he published during that year.

This fact was not known on this side of the channel until after gutta percha covered wires throughout the whole lengths of the circuit were also employed in this country, and that was in the year 1854.

To Dr. Faraday, however, is due the whole credit in this matter, and I have only alluded to its telegraphic history, as I cannot help feeling it as a sort of reproach to practical electricians that it should go forth that induction, which was manifesting itself step by step before their eyes, came suddenly and unexpectedly upon them. The following extract from Dr. Faraday's researches of 1838 is so instructive, and teaches such a valuable lesson, that I cannot refrain from quoting it. Alluding to Professor Wheatstone's well-known experiment, he says,—"If the two ends of the wire were immediately connected with two large insulated metallic surfaces exposed to the air, so that the primary act of induction, after making contact for discharge, might be in part removed from the internal portion of the wire at the first instant, and disposed for the moment on its surface, jointly with the air and surrounding conductors; then, I venture to anticipate, the middle spark would be more retarded than before, and if these two plates were the inner and outer coatings of a large jar, or Leyden battery, then the retardations of that spark would be still greater."

Previous to the first attempt to submerge the Atlantic cable, a series of experiments were undertaken by the company's late electrician, and the result published.*

These experiments having been tried, at the expense of much capital, and with opportunities which never before presented themselves, are too important not to be noticed, though it is believed that the author of them has lately had reasons to modify some of his conclusions.

The chief results published were these:—

1. That no adequate result is obtained by increasing the sectional area of the conductor; that, in fact, in the case of a submarine circuit—a small wire will transmit signals more rapidly than a larger one.

2. That an insulated submarine wire conducts according to a different law to that of a suspended circuit.

3. That the rate at which a voltaic signal travels is not affected by the intensity of the battery.

4. That magneto-electric induced currents have the property of traveling in the first place faster than voltaic ones; and, unlike voltaic currents, when their intensity is increased their rapidity of traveling is increased also.

* *Vide*, "The Atlantic Telegraph. A History of Preliminary Experimental Proceedings, &c., published by order of the Directers of the Company."

In the paper I submitted last March to the Institution of Civil Engineers, I pointed out what I conceive to be errors in these results, and endeavored to show that some of them necessarily followed from the way in which the experiments were conducted, and I cannot more clearly express what I wish to convey on this head than by quoting my own remarks on that occasion.

"In examining these conclusions, it has first to be considered whether the conditions of a submarine circuit and a suspended one are different. In a suspended wire, the insulating medium of the air takes the place of the gutta percha of the submarine circuit. The earth, which is the nearest conductor, is a considerable distance off, and is only on one side of the wire, therefore but little induction can take place between the wire and the earth; nevertheless, induction to a certain extent does take place, and can be perceived in circuits of very moderate length.

"The author has noticed indications of it in a circuit 60 miles long, and he feels confident that with delicate apparatus it could be perceived in much shorter circuits. If the distance between the wire and the earth were decreased, induction would be developed more strongly, and the wire could be brought down step by step until the condition of a submarine circuit would be approached, where the earth surrounds the circuit on all sides, and is only separated from it by the thickness of one-eighth or three-sixteenths of an inch of gutta percha—a substance possessing, moreover, specifically a much greater inductive capacity than air. It, therefore appears, that the conditions are precisely the same, only differing in degree. Before proceeding further, and to prevent the possibility of mistake, it is desirable to make the following quotation from the work previously referred to:—*

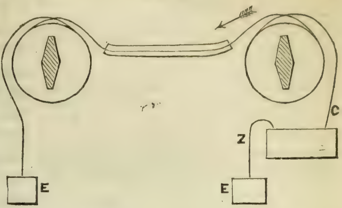
"'The law of squares may possibly apply to the transmission of electricty freely along simple conducting wires, but it certainly does not apply to the case of its transmission along submarine and subterranean gutta percha covered wires (the facility of transmission being estimated by rate of speed) because in this the case is not one of simple conduction, but of transmission, after the wire has been charged inductively to saturation as a Leyden jar.' This quotation shows clearly the reason for concluding that small wires are better conductors for submarine circuits, as far as transmission is concerned, than larger ones; for the smaller the Leyden jar the more quickly will it be charged to saturation. The author, in differing from these conclusions, does not wish it to be understood that he thinks the law of squares is applicable to submarine wires; for he is not aware of any electrical phenomena which obey that law, but he submits that there is a material difference between a Leyden jar and a submarine wire.

"In a Leyden jar the inner and outer coatings are perfectly insulated one from the other. If they were not insulated there could be no statical charge, as is well understood by all electricians. Induction therefore *involves insulation.* But in a submarine circuit this is not the case. If the wire at the further extremity was disconnected from the telegraph instrument, and sealed up with gutta percha, the condi-

* *Vide,* "The Atlantic Telegraph," page 23.

tions would be nearly the same. In practice, however, it is quite open through the instrument to the earth, and the resistance opposed by the very long length of wire is the only insulation between the inner and outer coatings, for it unites both, being in connexion with the earth at both ends (Fig. 5). It is therefore evident that if the wire offers no resistance there will be no insulation, and, as a consequence, no induction to retard the passage of the current. It is also equally plain that precisely in proportion to the resistance which the wire opposes, provided always the insulating medium be of the same thickness, will induction manifest itself and retardation be experienced.

Fig. 5.



"There is also another difference between a Leyden jar and a submarine circuit.

"The Leyden jar is charged uniformly all over, whilst in a submarine wire the tension of the charge varies in different portions of the circuit, being at its maximum at the end where contact is made with the battery, and dying off to nothing at the further extremity."

The next consideration is the part induction plays in submarine circuits of any considerable length.

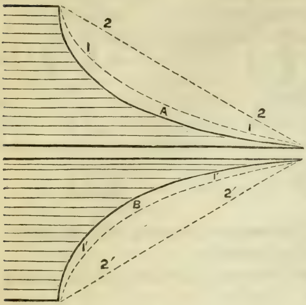
In a submarine circuit the wire is insulated from the earth by only a thin layer of gutta percha; the conditions, therefore, are favorable for induction through the insulating material; the conductor, itself, from its great length, opposes very great resistance, or, in other words, insulates to a very considerable extent.

When a battery is connected to send a current, the first impetus is in part directed forward, in part diverted laterally; but as the wire opposes considerable resistance to the passage of the electricity which the battery can generate, whilst the thinness of the insulating material is very favorable for induction taking place through it, the greater portion of the first rush will be occupied in charging the wire statically at the battery end; as, however, it is a balance of forces between the resistance which the wire opposes on the one hand, and the ease with which lateral induction can take place on the other, a very minute portion must pass through instantly, and the period which will elapse between the making contact with the battery and the observing the current at the further extremity, will depend upon the capability of the instrument to record very small quantities of electricity.

In fact, immediately on contact being made with the battery, a wave will be formed throughout the length of the wire, somewhat like what is shown in the diagram (Fig. 6), which is intended to represent a submarine wire the moment after contact has been made with the battery. The line A represents the internal charge having its maximum tension at the battery end, and diminishing in intensity as it approaches the

farther extremity. The line B shows the induced charge of the opposite kind on the outer surface of the gutta percha, and forms an exact counterpart to the internal charge, with the exception of being a little less intense; for as it is spread over a greater surface, and only exactly balances the internal wave, its tension will be less in proportion as its surface is greater. As the tension of the statical charge is raised, so will the flow of electricity at the further extremity increase; both will arrive at their maximum together; the current will then flow in a regular stream as long as contact with the battery continues. The dotted lines 1 1 and 1′ 1′ are intended to represent the waves after the contact has been made a short time, and the lines 2 2 and 2′ 2′ are intended to represent the waves when they have attained their maximum height.

Fig. 6.



In the last case they will be perceived to be more regular.

When the battery has been disconnected from the wire, the opposite waves will still continue to unite, but the rate of flow as the tension falls will become slower and slower.

In theory the time which would be occupied by a wire discharging itself completely in this way would be infinite. In practice the wire requires a very appreciable time to charge, and a longer period to discharge. The effect of this is, that if currents are sent at all rapidly one after the other, instead of obtaining a series of distinct impulses at the further extremity, an undulating continuous current is received; and, as to obtain a telegraphic signal, the wire has not only to be charged to a certain degree of tension before an appreciable current is received at the further end, but has also to be discharged afterwards before another signal can be sent, the impulses which are obtained through such circuits as these are very sluggish.

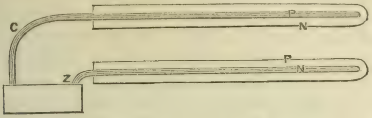
The problem to be solved is, the best means of reducing the amount of induction, and of mitigating its effects.

Almost the first remedy suggested when this inconvenience was experienced, was to substitute another insulated wire in the place of the earth for a return circuit, for it was argued that, as in this arrangement, one wire would be charged positively and the other negatively, they would neutralize one another.

This suggestion was put to the test and failed. Since that time the same plan has been revived by several others; a good deal of argument has also been brought forward lately in support of it, and even amongst those who know its practical inutility there would seem to have been lurking some faith in the capability of the method (in theory at least,) to neutralize the effects of induction.

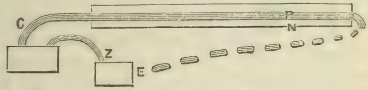
The explanation of its failure, if we are guided by the first principles of the science, appears to me to be very simple, and I expect not only to make it plain that no advantage is to be obtained by the adoption of this method, but that it will increase the retardation.

Fig. 7.



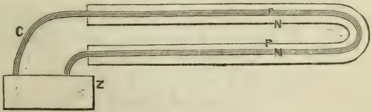
Let two long gutta percha covered wires, (Fig. 7,) buried in the earth, be connected, one with the zinc pole and the other with the copper pole of a battery, and let the farther ends of each of these wires be hermetically sealed. The earth, from its mass, being a perfect conductor, its action, it is evident, will be the same as if metal tubes in metallic communication with each other surrounded the gutta percha wires. It is therefore clear that the only retardation to induction will be the thickness of the gutta percha covering, and the tension of the statical charge will be in accordance with the intensity of the battery. Now consider the case of a similar gutta percha wire of the same length (Fig. 8) as one of these, but in which one pole of

Fig. 8.



the battery is connected to the earth and the other to one end of the metallic conductor, and the circuit completed by connecting the further extremity to the earth. It will also receive a statical charge to a certain degree, but the tension of the charge will not, *ceteris paribus*, be dependent upon the intensity of the battery, but upon the resistance which the wire opposes, for it has already been shown that this is the only real insulation between the wire and outer coatings, and that the degree to which statical charge can take place depends on the amount of insulation existing.

Fig. 9.



Now, let the ends of the two wires which are hermetically sealed be connected to each other, (Fig. 9,) the circumstances are quite as favorable for induction as in the wire in which one end was connected with the earth, but there will be twice the resistance; in other words,

double the amount of insulation, and, consequently, a proportionate increase in the amount of induction.

Another view of this matter will perhaps assist to confirm what has just been stated.

It is a well established fact that when a telegraphic circuit is composed of a loop of wire, it will oppose the same resistance as a circuit of double the length where the earth is made use of in the place of a return wire, and this proves that the earth offers no appreciable resistance. If this be the case, what difference can it make whether the battery pole be carried to the end of the wire itself, or through the medium of any length of a perfect conductor, which the earth has been proved to be? Therefore, it would appear that the induction which would be manifested in a circuit composed entirely of an insulated conductor, would be the same as that in a circuit of twice the length, where one-half the circuit is completed by the earth, and the only difference which would exist between the one and the other would be, that in a circuit composed entirely of wire, the statical charge will be distributed more uniformly throughout the entire length.

But, says a writer on this subject, I admit that no advantage would result if two separate wires are used, and which will therefore necessarily be some distance apart from one another, but place the two wires in the middle of a mass of gutta percha, (Fig. 10,) and so close to each other that they may become virtually the centre of a system, and let the insulating material be of considerable sectional area, then no induction worth naming will take place between the wires and the earth, and the inductive influence of the positive wire will neutralize that of the negative wire.

Fig. 10.

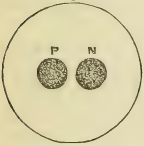
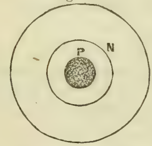


Fig. 11.



The fallacy of the proposition will be at once seen if it be carried out more fully. Instead of letting the wires lie side by side, let the one wrap over the other, and be, in fact, a tube with a thin mass of insulating material between it and the inner wire (Fig. 11.) They will now become really the centre of the system, and fulfil completely the object desired by the author of this suggestion, but is it not evident that such an arrangement is the fac-simile of a Leyden jar, and will not the conditions be the most favorable that can be conceived for the development of induction?

The only remedy which has been successful in mitigating the effects of induction, is that of throwing into the wire, immediately after a current has been sent, another of the opposite kind; this absorbs and neutralizes the preceding wave much more quickly than when the wire is left to discharge itself in the ordinary way. This method, however, does not reduce the induction, but only mitigates its effects, although in circuits of moderate length its adoption has, for practical purposes, completely removed the inconveniences arising from the induced charge.

(To be Continued.)

For the Journal of the Franklin Institute.

Particulars of the Steamer Yorktown.

Hull built by Wm. H. Webb. Machinery by Morgan Iron Works, New York. Intended service, New York to Richmond.

HULL.—

Length on deck, from fore part of stem to after part of stern post, above the spar deck,		250 feet.
Breadth of beam at midship section,		34 "
Floor timber—molded, 15 ins.—sided, 15 ins.		
Frames—apart at centres, 2 feet 6 inches—strapped with double laid iron straps, $4\frac{1}{2} \times \frac{3}{4}$ inches.		
Depth of hold,		9 " 6 inches.
" to spar deck,		17 "
Length of engine and boiler space,		78 "
Draft of water at below pressure and revolutions,		11 "
Area of immersed section at this draft,	330 sq. ft.	
Tonnage,	1400.	
Contents of bunkers in tons of coal,	150.	
Masts and rig—Fore-topsail schooner.		

ENGINES—Vertical beam.

Diameter of cylinders,		50 inches.
Length of stroke,		10 feet.
Maximum pressure of steam in pounds,	25.	
Cut-off—half stroke.		
Maximum revolutions per minute,	20.	

BOILERS—Two—Single return through two tiers of flues.

Length of boilers,		34 feet.
Breadth "		14 "
Height " exclusive of steam chimney,		12 " 6 inches.
Number of furnaces,	6 in all.	
Breadth "		4 " 2 "
Length of grate bars,		7 "
Number of flues,	28.	
Internal diameter of flues,		19, 16, and 11 "
Length of flues,		27 and 21 feet.
Heating surface (fire and flue),	6000 sq. ft.	
Diameter of smoke pipe,		6 feet 8 "
Height "		39 "
Description of coal,	Anthracite.	
Draft,	Natural.	
Consumption of coal per day,	26 tons.	

PADDLE WHEELS.—

Diameter,		30 feet.
Length of blades,		9 "
Depth "		18 inches.
Number "	26.	

C. H. H.

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*Chromo-Photography.**

An invention which is destined, no doubt, to create a revolution in the art of photography has recently been made by Mr. Backshell, of the Photographic Institution, Durham-place, Dalston, and which has received the protection of her Majesty's royal letters patent. It consists in producing, what has hitherto been considered impossible, a

* From the Lond. Mechanics' Mag., Sept. 1858.

beautifully-colored non-inverted photograph, equal in brilliancy of color and superior in detail to the most exquisite miniature extant. We understand that the studio of Mr. Backshell has been honored by the visits of several of the nobility and gentry, who have testified their appreciation of the invention by numerous orders. Licenses for the practice of the invention are being granted throughout the kingdom.

For the Journal of the Franklin Institute.

Particulars of the Steam Frigate General Admiral.

Hull built by Wm. H. Webb. Machinery by Novelty Iron Works, New York. Intended service, Imperial Russian Navy.

HULL.—			
Length on deck, from fore part of stem to after part of stern post, above the spar deck,		308 feet	6 inches
Breadth of beam at midship section,		54 "	6 "
Depth of hold to berth deck,		18 "	3 "
" " spar "		33 "	7 "
Floor timber, at throat—molded, 1 ft. 10 ins.—sided, 16 to 25 ins.			
Frames—apart at centres, 3 feet 2 inches.			
Length of engine and boiler space,		104 "	
Draft of water at load line,		23 "	6 "
" below pressure and revolutions,		22 "	
Area of immersed midship section at this draft, 836 sq. ft.			
Tonnage, custom-house,	4306 92-95.		
Contents of bunkers in tons of coal,	650.		
Masts and rig—ship rigged.			
ENGINE.—Two—Horizontal—Back action.			
Diameter of cylinder,			84 inches.
Length of stroke,		3 feet	9 "
Maximum pressure of steam in pounds,	20.		
Cut-off—half stroke.			
Maximum revolutions per minute,	52.		
Weight of engines,	175 tons.		
BOILERS.—Six—Horizontal tubular.			
Length of boilers,		10 "	3 inches.
Breadth "		19 and 22 "	
Height " exclusive of steam chimney,		12 "	6 "
Weight of " without water,	250 tons.		
Number of furnaces,	38.		
Breadth "		2 "	7 "
Length of grate bars,		7 "	6 "
Number of tubes,	2760.		
Internal diameter of tubes,			3 "
Length of tubes,		7 "	
Heating surface,	21,000 sq. ft.		
Diameter of smoke pipe,		11 "	
Height "		65 "	
Draft,	Natural.		
Consumption of coal per hour, maximum,	4 tons.		
PROPELLER.—			
Diameter of screw,		19 feet.	
Pitch "		31 "	
Length of blades,		7 "	
Number "	two.		
Geared—Direct action.			

C. H. H.

*Production of Engravings by Photography.**

There are, as is now tolerably well known, two or three processes for the production of engravings by photography—the chemical agent in them being the bichromate of potash. M. Jobart not only introduces a material new for this special purpose—but he has shown that the well-known material, the iodide of silver, possesses a new property which renders it available to this end. A lithographic stone, or a plate of zinc, is covered with the iodide of silver, and a picture obtained upon it in the usual manner. It is then immediately covered with a thick solution of gum arabic mixed with lampblack and placed aside in the dark. When the coating of gum is thoroughly dry the stone or the zinc plate is plunged into water. The parts over which the iodide has been decomposed are removed with the gum, and all those parts receive the lithographic ink readily, while the other parts resist it. Thus the stone or zinc plate is at once prepared, and, says M. Jobart,—who makes this communication to the Academy of Sciences of Paris—we obtain thus the whites pure and the proofs perfect in all their details—but the operation is a delicate one.

Mineral Statistics of Great Britain.†

An interesting return has recently been published by order of the Lords Commissioners of the Treasury, by the Museum of Practical Geology, showing the quantity of mineral ore obtained from the British mineral districts during the past year. The following are the principal points of interest:—The quantity of pig iron made in 1857 was 3,659,447 tons,—being an increase, notwithstanding the depression of the iron trade, of 73,070 tons over the quantity produced in 1856. The importations of tin ore, including 816 tons from our colony, Victoria, amounted during the past year to 4095 tons. Under the head of copper there is considerable difficulty in arriving at a just estimate of the produce, from the circumstance that very large quantities are purchased by private contract, alike from British and Foreign mines, and it is almost impossible to separate these. It is believed, however, that this has been more closely effected in the present return than has been done in any former year. The purchases of the Copper Company in Cornwall, for 1857, show a decrease of 1414 tons; and those in Swansea, of 840 tons upon the previous year. The exports have been in 1856, 22,863 tons; and in 1857, 25,241 tons. The production of lead has been, in 1856, 73,129 tons; and in 1857, 69,266 tons;—of silver in 1856, 614,188 oz.; and in 1857, 532,866 oz. The importations of lead exhibit a falling off of about 3000 tons; and of foreign silver ores, instead of 6,636 tons, the quantity brought into this country in 1856, we only imported 5190 tons,—being a decrease of 1440 tons. The return of coal production is a remarkable test of the depression of commerce during 1857. For while the quan-

* From the Lond. Athenæum, Feb., 1859.
† From the Lond. Athenæum, December, 1858.

tity produced and sold in 1856 amounted to 66,645,450 tons, that of 1857 was only 65,394,707 tons,—being a falling off of 1,250,743 tons. The following tables show the values of the mineral and metallic produce of the United Kingdom in 1857, excepting clays and stones:—

Minerals.

Tin ore,	£ 743,508
Copper ore,—the product of all the sales, excluding foreign ores, but including private contract purchases,	1,560,922
Lead ore (containing silver),	1,428,095
Zinc ore,	30,982
Iron pyrites,	63,804
Arsenic,	919
Nickel and Cobalt,	219
Iron ore,	5,265,304
Coals,	16,348,676
Salt,	506,720
Barytes and other minerals,	12,500
	£ 25,961,649

Metals.

Tin,	£867,680
Copper,	2,166,900
Lead,	1,523,852
Silver,	133,216
Zinc,	450,000
Pig iron,	12,838,560
Other metals,	125,500
	£ 18,105,708

The returns have been compiled by Mr. R. Hunt, and comprise many details of considerable interest.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, July 21, 1859.

John C. Cresson, President, in the chair.

Isaac B. Garrigues, Recording Secretary.

The minutes of the last meeting were read and approved.

A letter from the American Institute, of the City of New York, was read.

Donations to the Library were received from the Commissioners of Patents, the Royal Astronomical Society, and the Statistical Society, London; the Catholic University of Ireland, Dublin; des Oesterreichischen Ingenieur-Vereines, der K. K. Geologischen Reichsanstalt, der K. K. Geographischen Gesellschaft, Vienna, Austria; the Board of Arts and Manufactures for Lower Canada, Montreal, Canada; Prof. A. D. Bache, U. S. Coast Survey, Washington, D. C.; Hon. David Dale Owen, Little Rock, Arkansas; the American Institute, City of New York; the North Missouri Railroad Co., St. Louis, Missouri; B. H. Latrobe, Esq., C. E., Baltimore, Maryland; the Board of Water Commissioners of the City of Detroit, Michigan; the N. O. Academy of Science, New Orleans, Louisiana; the Young Men's Mercantile Library Association, Pittsburgh, Penna.; Messrs. Jones, White, and McCurdy, Prof. John F. Frazer, and the Board of Trade, Philada.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement of the receipts and payments for the month of June was read.

The Board of Managers and Standing Committees reported their minutes.

One resignation of membership in the Institute was read and accepted.

Candidates for membership in the Institute (8) were proposed, and the candidates (7) proposed at the last meeting were duly elected.

The President made a brief statement relative to the hail storm and tornado which passed over the northern part of the City on the afternoon of July 20th.

From an elevated position he had a full view of the storm when distant about 6 miles to the N. W. A portion of the cloud, apparently about half a mile wide, appeared pendant from the main body, reaching to the ground; within this chimney-like column there was evidently a violent upward movement, the masses of cloud being carried up with great velocity as soon as they formed, and vivid streaks of lightning traversed vertically near the centre of the column.

The form of the whole cloud was that of an enormous mushroom, with a stem more than 2000 feet in diameter, and a head several miles across.

Mr. Wm. Stacey exhibited a spring balance, designed by Mr. Dana Bickford, of Westerly, R. I., as a substitute for the weights ordinarily used to balance window sashes; it consists of a coiled spring contained within a cylindrical band, to which its outer extremity is attached, whilst its inner extremity is attached to a fixed pin, about which the band rotates; the whole is mounted in a box which is intended to be let into the window frame near the top of the sash. A cord is attached by one end to the sash, whilst the other is attached to the band enveloping the spring, which is wound up, so as to give a tension sufficient to balance the sash. It is claimed to be cheaper than the old method, as no boxing is required for the weights.

Also, Mr. A. W. Decrow's safety alarm drawer lock, which can be put upon an ordinary drawer at a slight expense. The alarm is operated by the endeavor to open the drawer, unless three projecting pins on the under side of the drawer, which permit of combinations, are moved into the propor positions by the fingers as they fall upon them in the act of pulling the drawer outwards. In that case, the drawer opens without noise; but, if the combination is not the proper one, a catch, which projects upwards within the drawer, not only prevents the opening, but, by its contact with the containing frame of the drawer, releases a catch which sets a bell ringing, thus notifying the proprietor.

Messrs. Code, Hopper & Co., had upon the exhibition table, for inspection and trial by the members, a spirometer registering to the tenth part of a cubic inch. It has the same internal mechanism as a dry gas metre, and is a handsome specimen of their manufacturing skill.

Abstract of Meteorological Observations for May, 1859; made in Philadelphia, Somerset, Dauphin, and Centre Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

1859.	PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.									SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.						HARRISBURG, Dauphin Co. 40° 16′, N. 76° 15′, W. JOHN HEISELY, M D., Obs.				FLEMING, Centre Co. Lat. 40° 55′ N. 77° 53′ W. Ht. 780 ft. S. BRUGGER, Obs.		
	Barometer.		Thermometer.			Relative humidity.	Force of vapor.	Rain.	Prevail'g winds.	Bar.	Ther.	Relative humidity.	Force of vapor.	Rain.	Prevail'g winds	Bar.	Ther.	Rain.	Prevail'g winds.	Ther.	Rain.	Prevailing Winds.
May.	Mean.	Mean daily range.	Mean.	Daily oscillation.	Mean daily range.	2 P. M.	2 P.M.			Mean.	Mean.	2 P.M.	2 P.M.			Mean.	Mean			Mean.		
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	Direc.	Inch.	°	Per ct.	Inch.	Inch.	Direc.	Inch.	°	Inch.	Direc.	Inch.	Inch.	Direc.
1	29·960	·216	60·0	19	7·3	18	·121		N E.	27·724	58·0	46	·329		E.	29 876	63·3		S.	58·3		S E.
● 2	29·948	·063	65·0	33	8·3	42	·388		W.	27·748	61·7	42	·388		N.	29·879	65·0		S.	59·3		W.
3	30·066	·118	59·3	18	8·0	41	·273		N E.	27·804	64·0	46	·389		S E.	30·006	63·7		S E.	60 0		S E.
4	30·153	·096	57·7	28	3·0	30	·235		(var.)	27·865	62·3	45	·401		S E.	30.070	62 3		S.	67·3		S W.
5	30·099	·054	59·8	27	2·2	34	·265		S W.	27·851	65·3	45	·457		E N E.	30·022	64·3		S.	63·3		(var.)
6	29·949	·151	63·0	30	4·2	34	·303		S W.	27·753	67·0	52	546		N.	29·872	69·3		S.	66·7		W.
7	29·788	·161	70·5	27	7·5	40	·441		S W.	27·649	69·0	47	·503		S E.	29·703	75·3		S.	70·0		(var.)
8	29·653	·135	73·0	29	2·5	32	·383		S W.	27·525	70·0	46	·562		(var.)	29·554	76·3		S.	69·0		S W.
☽ 9	29·556	·097	74·5	25	2·2	40	·468		S W.	27·415	69·3	49	·557		(var.)	29·424	77·7		S.	70·0		(var.)
10	29·673	·117	51 8	5	22·7	80	·321	0·182	N E.	27 446	62·3	64	·495	0·032	(var.)	29·587	57·7		E.	55·7	0·340	E.
11	29·842	·169	49·7	6	2·2	86	·322	0·008	N N E.	27·627	56·7	55	·336		E.	29·804	54·7		E.	57·0		E.
12	29·899	·057	57·5	18	7·8	72	·415		N E.	27·701	60·3	61	·448		S E.	29·862	64·3		S E.	62·0		(var.)
13	29.891	·017	67·5	24	10·0	56	·504		(var.)	27·724	68·0	53	·596	0·130	N W.	29·809	72·0		S.	74·7		(var.)
14	29·922	·030	69 7	16	2·8	36	·317		N.	27·790	62·0	61	448		N.	29·888	70·3		N W.	65·0		N W.
15	30·011	·089	62·5	19	7·2	38	·285		N N E.	27·788	60·3	47	·395		(var.)	29·935	67·3		N.	58·3		N W.
○ 16	29·992	·083	56·0	21	6·5	27	·175		E S E.	27·644	56·7	49	·315	0·270	S S E.	29·890	63·0		S E.	60·7		S W.
17	29 742	·249	56·3	15	5·3	71	·382	0·074	S E.	27·416	60·3	71	·537		(var.)	29·618	58·7	0·100	E.	55·7	0·240	W.
18	29·710	·034	59·8	10	3 5	83	·478	0·118	E.	27·446	61·3	58	·475		S S E.	29·603	63·3	0·482	E.	61·3		S E.
19	29·701	·046	65·3	13	5·5	85	·621	0·015	E.	27·505	65·7	50	·499		E.	29·632	67·0		W.	69·3		(var.)
20	29·826	·125	66·5	10	1·2	75	·572	0·016	E N E.	27·627	66·3	64	·554		E.	29·751	71·7		S.	69·3		(var.)
21	29 735	·093	68·7	16	4·5	77	·691	0·811	(var.)	27·535	70·7	53	·622	0·419	S W.	29·631	73·3	0·294	S E.	68·7	0·500	(var.)
22	29·678	·102	65·0	8	8.3	80	·462	0·197	S W.	27·546	55·7	57	·327		W.	29·589	69 0		W.	59·0		N W.
23	29·962	·250	65·2	22	7·2	36	·299		N W.	27·736	58·0	59	·442		?	29·878	66·7		W.	60·7		W.
☾ 24	30·063	·101	69·7	26	4·5	40	·394		S W.	27·796	63·7	51	·522		S E.	29·956	71·3		S.	68·0		S W.
25	30 045	·033	70·0	24	0·3	43	·429		S W.	27·806	68·7	51	·589		W.	29·956	73·7		S.	68·3		S E.
26	29·943	·103	72·0	26	2·0	36	·410		S W.	27·758	70·7	51	·636		W.	29·826	76·3		S.	68·7	0·190	S E.
27	29·719	·224	74·3	26	2·3	41	·492	0·430	S W.	27·548	64·7	59	·497	0·112	W.	29·572	77·3	0·462	S,	70·7	0·205	(var.)
28	29·745	·111	64·7	11	9·7	42	·289		S W.	27·607	54·0	61	·341		W.	29·656	62·3		N W.	56·7		N W.
29	29·820	·075	71·7	29	9·0	26	·265		S W.	27·660	62·0	52	·448	0·281	(var.)	29·720	68·3		W.	62·7		N W.
30	29·972	·152	70·2	16	5·5	53	·513		S E.	27·794	67·3	59	·649		W S W.	29·902	72·0		W.	65·7	0·254	(var.)
31	30·042	·077	67·5	12	5·0	52	·366	0 095	S E.	27·754	60·0	88	·473	0·412	S E.	29.918	66·3	0·060	S E.	60·0	1·500	E.
Means	29·874	·111	64·6	20	5·7	50	·383	1·946	S 7½ W.	27·664	63 3	55	·477	1·656		29 787	67·9	1 398		64·0	3·229	

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

SEPTEMBER, 1859.

CIVIL ENGINEERING.

Improvements in the Hanging and Arranging of Cylindrical, Conical, or Spiral Steel Railroad Springs for Railway Carriages,—being a Communication.—Patented by WILLIAM EDWARD NEWTON, London, October 19th, 1858.*

This invention consists in arranging cylindrical, conical, or spiral steel railroad carriage springs in groups or series of four or more springs, placed in double lines vertically, so as to possess the length of elastic action which two series of the springs would have if placed the one above the other, while the space which they occupy vertically is very much less than they would require if the springs were placed in pairs, one above the other.

Figure 1 shows, in side elevation, a group of four springs, with the stirrup or suspension-bracket by which they are suspended, and the top plates or caps in which they are set; and figure 2 shows, in side elevation, the manner of arranging and hanging the springs, in series or lines, between the forward and after pedestals of the truck of the car.

The springs represented are Gardiner's conically coiled steel springs, having an open central space or vertical axis; and the suspension-brackets or bars are adapted particularly to their use, but will answer for any other cylindrical spring.

In fig. 1, *s*, *s′*, are the two lower springs, placed small end downwards, and side by side, their upper edges being parallel with each other. Upon the upper edge or periphery of the spring *s*, is placed

* From Newton's London Journal, July, 1859.

the suspension-bracket *b*, having its cup or cap to fit the head of the spring; it extends downwards by the side of the spring *s*, to *b′*,—that is to say, about three-fourths the length of the spring *s*,—when it is bent at right angles, and is continued in a horizontal direction *b″*, (the length of the largest diameter of the spring,) to form a base for suspending the spring *c;* the bracket then turns vertically upwards, as at *b‴*, until it reaches the top of the spring *s′*, when it again becomes horizontal, so as to cover with its cap the head of the spring *s′*. After covering the head of the spring *s′*, it is again bent downward to a point parallel with *b″*, when it is again bent in a horizontal direction, to form a base for sustaining the spring *c′*, as shown by the dotted lines, which indicate the continuation of the spring *c′*; the bracket *b*, *b′*, *b″*, *b‴*, is then turned upwards, and becomes again connected with *b*, at the cup or cap of the spring *s*. The two pairs of springs thus arranged stand each in the angle made by the other, so that their caps are diagonal, and at right angles to each other. The two lower springs *s*, *s′*, are carried by a plate *a*, on the lower beam, and in order to hold them securely in place, they stand on conical studs or short vertical pins. The lower horizontal part of the bracket at *b″*, should just be so far above the supporting bar *a*, as to allow the springs *s*, *s′*, full play, that is, to shut down upon the spiral coils; and at the same time, the cap of the two springs *c*, *c′*, should be so far above the plate that crowns the springs *s*, *s′*, as to allow in like manner the spirals of *c*, *c′*, to shut down upon

Fig. 1.

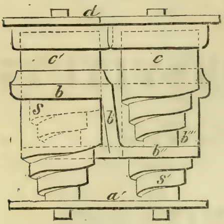
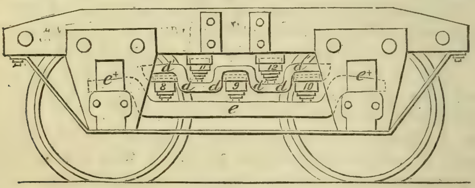


Fig. 2.



each other, so that, by this means, the whole length of elastic leverage of the two springs *c*, *s*, is attained, while the vertical space which they would occupy if placed one directly over the other, is reduced about three-quarters of the height of one of the springs. As a guard or shield to the springs, a thin iron disc of boiler plate iron is placed upon the head of each spring, between which disc and the under surface of the crowning cap is placed thick felting; the cap is flanched to receive the head of the spring and disc upon it, as into an inverted cup, by which means the springs are held in place at the crowns or top; the upper crown plate is firmly secured to the proper appendage under the car, for swinging the car upon the springs.

Another mode of carrying out the same principle of double tiers of springs within a greatly reduced vertical space, is by placing four or more springs in a series or line upon two grouping lever bars, one above the other, between the pedestals and the ends of the bars, having their bearings in the pedestals, as shown at fig. 2, in position under the car at *d* and *e*. The lower lever bar *e*, is horizontal and straight, except at the ends, where it is bent obliquely upwards, and again horizontally, so as to enter the pedestals at each end, and rest upon the top plate of the journal box, as at *e**, *e**. It is secured in its place by being let into a recess, or by a projection upon its under side, and a corresponding recess in the pedestal to receive the projection. Upon the upper surface of the bar *e*, are three vertical conical studs, upon and over which studs are placed the springs 8, 9, 10, in a straight line, and under the side timbers of the truck of the car; this bar *e*, should be a little thicker at the bent parts, to give it strength, as shown. Directly above the bar *e*, is hung the other lever bar *d*, bent alternately up and down; its upper parts resting upon the caps of the springs 8, 9, 10, and its lower parts forming a support for the two upper springs, 11 and 12, of the group which are placed over vertical conical studs on the bar. The crowns or caps of the upper springs 11, 12, face the under surface of the side timber of the truck or car, upon cup castings and discs, which rest upon the springs on either side. The last-mentioned bar *d*, has its ends jut within the arms of the pedestals, where it is held so as to have no lateral motion, and so as to permit the required play within the pedestal up and down; the ends of the bar being spread to very nearly the space between the arms of the pedestal, to avoid lateral motion.

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*On the Relative Values of Coke and Coal in Locomotive Engines.**

By Benjamin Fothergill.

(Continued from page 95.)

There yet remains the question of the durability of the fire-boxes and tubes when coal is used instead of coke, and I do not think that I could offer a better proof of the superiority of coal over coke in this respect also, than by quoting a portion of a report which I made on this important subject on the 26th of May, 1858, to the Locomotive Superintendent of the Manchester, Sheffield, and Lincolnshire Railway. The engines there referred to were built in accordance with Mr. Beattie's patent for burning coal and coke:—

"With respect to the durability of the tubes and fire-boxes, when coal is used instead of coke, I consider that question to be settled beyond dispute in favor of the former, inasmuch as it no longer remains a matter of opinion merely, but the result of continuous working with coal and coke demonstrates beyond all doubt that not only is coal superior to coke in respect to heating power, and consequently decidedly

* From the Jour. of the Society of Arts, No. 339.

more economical, but it is less injurious to both the tubes and fire-boxes of locomotive engines; as a proof of this I beg to append a copy of a tabular statement which I had the honor of laying before the directors of the London and South Western Railway in the month of March, 1856, showing the average duration of a set of tubes in their locomotive engines when coke alone was used. At that time as well as in the latter part of 1855, after I had made a series of experiments with coke and coal, I came to the conclusion that the tubes and fire-boxes would sustain less injury by the use of coal than coke, and although one of their coal engines had then run but 51,300 miles and no really appreciable depreciation had taken place in either fire-box or tubes, I saw sufficient to warrant me in concluding that the life of a set of tubes, as well as that of the fire-box, would be considerably prolonged by the use of coal instead of coke. Time has proved that the opinion I then formed was a correct one, inasmuch as I have, up to the present moment, carefully watched the effects produced on the fire-boxes and tubes of the locomotive engines on the London and South-Western Railway; and taking two of their engines which I have examined, where even part coke and part coal have been used up to the commencement of the present month, you will perceive the amazing difference in favor of coal when you compare the results with the tabulated statement copied from my printed Report, dated March 25th, 1856.

Miles Run by the Undermentioned Coke Engines, with One Set of Tubes, on the London and South Western Railway.

Working Pressure of Steam.	Name of Engine.	Miles run.
100 pounds,	Volcano,	118,978
100 "	Stromboli,	127,855
100 "	Vulcan,	128,947
100 "	Milo,	104,627
100 "	Etna,	105,985
90 "	Ruby,	101,905
90 "	Serpent,	92,048
80 "	Medusa,	106,590
100 "	Windsor,	99,907
100 "	Mercury,	73,100
80 "	Fire King,	102,258
80 "	Mazeppa,	89,059
100 "	Sussex,	99,624
100 "	Mars,	103,257
100 "	Comet,	97,201
80 "	Hawk,	74,955
80 "	Acheron,	87,759
100 "	Test,	76,182
100 "	Stour,	69,688
100 "	Rocklia,	86,469
100 "	Avon,	78,785
100 "	Trent,	65,634
100 "	Frome,	83,108

Average duration of tubes, 94,518 miles.

"From the above table you will perceive the average duration of a set of tubes was 94,518, whilst in the two engines I have referred to,

where coal and coke have been used, one of them has run 154,955 miles, and is now carrying 120 pounds pressure of steam, none of the tubes having failed, and they are still in good working condition, and I am unable to say how much longer they will last. The other engine has run 137,676 miles, and I have had two of her tubes sent to my office in Queen's Chambers, Manchester, which you can see at any time.

"I personally paid a visit to the works at Nine Elms and examined these engines; and, bear in mind, that although a portion of the fuel used in these engines is coke, yet the tubes I now refer to have only worn to the extent of three wire gauges in thickness; they were ordered and made to No. 13 wire gauge, and are now No. 16 wire gauge.

"No doubt exists in my mind that the principal portion of this amount of reduction in thickness is attributable to the cutting action of the coke, and not to the effect of any deterioration produced by the action of the coal. With regard to the effect on the fire-box of the latter engine, the back, sides, and crown, are $\frac{1}{32}$ of an inch less than their original thickness, namely, $\frac{1}{2}$ an inch; the tube-plate has been reduced $\frac{1}{16}$ of an inch, the original thickness being $\frac{3}{4}$ of an inch. From these facts you will be able to draw your own conclusions—they speak for themselves—for in one case, where coke alone was used, you have an average (taken from the Company's books) of 94,518 miles as the life of a set of tubes, whilst in the other, where coke and coal are used on the same railway, and working similar trains, you have 154,955 miles run in the one case, and 137,676 miles in the other, and the tubes still in good working condition.

"I have given you these facts as a sample of the results when coke and coal are used, because the fuel you are using in your engines is of a similar character; but I am prepared to prove that were your engines constructed to burn coal alone, the fire-boxes and tubes would be protected from the cutting action of the coke, and greater durability, much beyond the mileage I have reported for coke and coal, would be the result. I am not ignorant respecting the argument that some persons have advanced as to coal containing a greater amount of sulphur than coke; this is a fallacy which I have had proved beyond doubt, and therefore I hesitate not to give you a strong opinion in favor of coal, for instead of its proving destructive to fire-boxes, tubes, or smoke-boxes, the result of my observations and experiments proves the contrary."

In further confirmation of the increased durability of the tubes, I beg to state that the mileage of another engine of the same class as the two referred to, and burning a mixture of coke and coal, amounts to 181,589 miles, and the tubes are still in good condition, and working at a pressure of 120 pounds to the square inch.

In conclusion I beg to remark, that previously to the year 1853, several attempts had been made by different individuals to introduce coal as a substitute for coke in locomotive engines, but from various causes they did not persevere in developing its true commercial value, and I would take this opportunity of stating that the credit of this

important saving in railway expenditure is due to the skill and persevering industry of Mr. Joseph Beattie.

Summary of Experimental Trips made on the London and South Western Railway.

DATE.	Name of Engine.	Description.	Average time in hours and minutes.	Average speed in miles per hour.	Average feet consumed in pounds per mile.	Coal reduced to its coke value.	Quantity of water evaporated per mile in lbs. for 1 lb of fuel.	Highest temperature of water in tender during each trip.	Lead in number of carriages.	Weight of train including engine and tender. Tons.	Cwt.	REMARKS.
1855. Nov. 15,	Ironsides,	Coal,	2·31	31·25	16·71	11·14	8·29	124°	12·2			Beautiful, clear, frosty day and calm.
" 16,	"	"	2·31	30 68	17·24	11·49	6·72	158°	10·6			Damp foggy day, rails greasy for fifty miles.
" 17,	"	"	2·39	29·71	19·02	12·68	7·07	164°	12·1			Clear day, with strong side wind in favor of down, and against up journey.
" 19,	Vesuvius,	Coke,	2·36	30·27	20·62		7·15	76°	12·1			Wet drizzling rain, with light wind on our back.
" 20,	"	"	2·26	35·23	20·62		7·78	74°	12·2			Rails rather greasy; wind against down journey.
" 22,	Frome,	"	2·27	32·14	20·97		7·62	94°	13·3			" "
" 23,	Canute,	Coal,	2·11	36·76	16·71	11·14	7·35	166°	9·3			Fine clear day, with light wind in favor of down journey.
" 30,	"	"	2·49	27·65	20·51	13·67	8·26	142°	19·0	170	8	Fine frosty day; rails greasy for first 50 miles.
" 30,	Vesuvius,	Coke,	2·56	26·54	23·82		8·21	54°	19·0	167	12	This was the first trip with equal loads.
Dec. 1,	Canute,	Coal,	2·39	29·16	20·22	13·48	8·07	180°	19·0	170	8	Great difficulty in starting. Rails slippery in consequence of frost and damp fog; wind rather stiff against us.
" 1,	Vesuvius,	Coke,	2·47	27·92	24·92		7·78	54°	19·0	167	12	
" 19,	Canute,	Coal,	2·55	26·92	29·80	19·86	9·05		28·0	235	13	Frosty, with strong head wind against us.
" 19,	Vesuvius,	Coke,	3·09	24·71	30·16		7·13	36°	22·0	189	6	Water pipe in Canute gave way. Shut off heating apparatus.

Discussion.—The Secretary read the following communication, received from

Mr. D. K. Clarke, who says—I perfectly agree with Mr. Fothergill in assigning to Mr. Beattie the honorable position of pioneer in the successful practical introduction of coal as a substitute for coke in locomotive engines, as there can be no question that, by his persevering efforts, he first succeeded in fairly arousing public attention to the real magnitude and importance of the economy in working expenses in railways that might be effected by the general use of coal as fuel. I believe that from this source of economy alone an addition of nearly 1 per cent. may be made to the dividends on the original share capital of railways, taking one with the other, with the reduced tear and wear of locomotives so ably pointed out by Mr. Fothergill. I think, however, that the mode adopted in the paper, of illustrating the saving in cost effected by the substitution of coal for coke is open to criticism, and does not place the question on its proper basis. It is true that the quantity of coke manufactured from a given weight of coal weighs only two-thirds of the orignal coal so consumed, and that 1½ tons of coking coal make only 1 ton of coke. But in seeking to establish this ratio of 3 to 2 as the measure of saving, that is, that the cost of fuel is reduced one-third in dispensing with the coking process, it is overlooked that coking coal, as coal, is not the proper fuel for locomotives, and that therefore the calculation of saving should be based, not upon the relative quantities of coking coal and of coke made from it, but upon the relative prices and efficiency of proper locomotive coal and coke. This ratio is necessarily very variable, as it is affected by cost of transport and other elements. For instance, on one metropolitan line, whilst coking coal costs 12s. 6d. per ton, and the coke made from it costs 18s. 6d., other coal, suitable for locomotive uses, costs as much as 15s. per ton. On another line, whilst the cost of coke is 23s. per ton, the coal suited for locomotives costs 20s. per ton, or only 13 per cent. less. Again, take the North Eastern Railway at Newcastle, the difference of the cost of coke at from 8s. to 11s., and locomotive coal, at 7s. per ton, is so inconsiderable as to scarcely make it worth while to use coal on that line. Notwithstanding such local approximations in cost, there can be no doubt of the economical importance of the question before the meeting. Again, in the comparison of the coal-burning engines with the coke-burning engines of the South Western Railway no allowance has been made for the benefit of heating the feed-water in the former, as against the use of cold water in the latter; whereas my own experience with Mr. Beattie's engine, the Canute, showed a most material increase in the consumption of coal when the feed-water was not heated. The following were the results I obtained from the engine with hot and cold water respectively :—

	Average train.	Coal consumed per mile.	Temperature of feed-water.
With heated water,	11 carriages,	17·4 lbs.	191 deg.
With cold water,	11 "	24·0 "	56 "

Showing an increase of 6·6 lbs. of coal per mile, by using the feed-water cold, as was done in the coke-burning trials recorded by Mr. Fothergill. The coke value would therefore be 16 lbs. per mile, and

not 11 or 12 lbs., as assumed in the paper, for comparison with the coke-burning engines. The large extra consumption of coal, by shutting off the heating apparatus, is no doubt greater in proportion than would be deducible from the known constituent heat of steam and water; but it is caused also by the less favorable working conditions of the engine involved in the use of cold water. I hope on another occasion, to bring the results of my own practice in coal-burning without smoke before the Society.

The CHAIRMAN said the paper they had heard was a very interesting one, and reduced itself to this:—Mr. Fothergill proposed to establish that which appeared to be a very simple proposition, namely, that the whole was greater than its part; in other words, that coal which contained all the elements of combustion and locomotive power was more effectual than the same coal when deprived of some of its elements and converted into coke. It was a most important subject, not only to railway companies, but also to the public at large, who must derive great advantages from the enormous saving in the expenditure for fuel, which Mr. Fothergill had pointed out, and his arguments appeared to have great plausibility. He (the Chairman) would now be happy to hear the opinions of gentlemen present, whom he knew to be well acquainted with the subject.

Mr. GRANTHAM had listened with great pleasure to Mr. Fothergill's paper, as treating of a subject of very great importance, not only in a scientific point of view, but also as affecting the dividends upon railway property. He must confess that his friend's paper had a little disappointed him upon one or two points, and if it should be agreed that some matters of importance had been omitted, he would call upon the Society to award a gentle punishment to Mr. Fothergill, by asking him to read a further paper upon the same subject. He would, in the first place, call Mr. Fothergill's attention to what he considered an important omission in his paper, he not having stated whether he employed the hot water apparatus in the coke-burning engines, as well as in those burning coal. Perhaps Mr. Fothergill would be good enough to enlighten them upon that subject. He would also ask him whether he had considered the question of the blast in the coke and coal-burning engines, as he was of opinion that a much greater heat would be found in the smoke-boxes of the latter than of the former, and less blast would therefore be required. That was an important point. Mr. Fothergill had stated that the wear and tear of the tubes of the boiler was very much less in the coal than in the coke-burning engines. That fully corresponded with his own experience; but there was another element to be considered, viz:, the first cost of this particular description of engine. There might be a question whether the first cost of the engine, which appeared to be an expensive one, did more than make up for the difference in the wear and tear under the two systems. He did not say this with a view to depreciate the statements made in the paper, for he was an ardent admirer of the use of coal in locomotives. There was also another very important question —viz: the heat of the gases in the smoke-box. He was afraid that railway engineers had overlooked this too much, and he feared also

that those who had made experiments upon the subject had made some mistakes. He had lately taken pains to make inquiries of some of the leading engineers as to the heat in the smoke-boxes of locomotives, and the answer he got generally was, that experiments had been tried, and that the temperature had been reduced as low as 300 deg. of heat; others had informed him that it was about 400 deg. of heat in the smoke-box. A curious experiment had been tried in his own neighborhood, where a thermometer had been let down into the smoke-box, the bulb of the mercury going into the box for some distance, and the scale being in sight of the engineer. When the engine was standing at the station the thermomter recorded 300 deg., but it had no sooner started than the thermometer fell to 150 deg. This gave rise to some speculation as to the cause of this wonderful phenomenon, and many theories would, perhaps, have been founded upon it; but the whole was easily explained by the fact that round the thermometer there was a space, so that when the engine was put in motion, and the blast came into operation, the cold air struck upon the bulb of the thermometer, and lowered the temperature of the mercury. He believed the temperature of the fire-box would be much affected by the use of coal, and he was sorry that Mr. Fothergill had not brought that subject forward as an element in his experiments. Within the last few weeks he had been called upon to try some experiments upon locomotive engines in connexion with a subject which he was happy to see illustrated by some specimens upon the table that evening, which he hoped would come before the Society at a future time in a more connected form. Referring to these specimens of spiral heat-diffusers, Mr. Grantham went on to explain that the glass tubes shown, represented the tubes of a boiler, and contained a spiral bar of metal. This was the invention in the first instance of Mr. Duncan, a gentleman of considerable scientific attainments, who took out a special patent for it. Their mutual friend, Mr. Charles Wye Williams, whose name was honorably known to the Society, without being aware of these experiments, was making others in the most accurate manner of his own upon the same subject, and on an extensive scale. Mr. Wye Williams' apparatus was also the subject of a patent; and as these patents clashed with each other, and there were points in each which the other party thought desirable to be retained, they amalgamated their interest, and the invention was now known under the designation of Duncan, Gwynne and C. Wye Williams' heat-diffusers. Mr. Grantham proceeded to detail the results of experiments made with the heat-diffusers as recorded by Gauntlett's pyrometer. The diffusers were placed in the tubes of the boiler, and he knew from experiment that they reduced the heat in the smoke-box prodigiously, probably 200 or 400 deg. The indication of the pyrometer with the heat-diffusers was 800 deg. in the smoke-box, and he believed it would have risen to 1000 or 1200 deg. if the heat-diffusers had not been in use. He had every reason to suppose that if coke had been used in the engine instead of coal, the heat in the smoke-box would have been less. If, therefore, Mr. Beattie's or any other coal-burning engine had this enormous temperature in the smoke-box, it was evident that there was room for improve-

ment in that respect, and it was another item in favor of coal if these deductions were correct. He would state in passing that the heat-diffusers above alluded to, promised very good results, the first trials showing nearly 20 per cent. of gain, and one of the practical difficulties in using them, viz: the supposed tendency in the tubes to become closed with ashes, had not taken place. Looking at the title of the paper, he regretted that Mr. Fothergill had confined his observations to one system only, as he was aware that he had an abundant store of information upon the burning of coal under other circumstances. He did not say this to detract in any way from the merits of Mr. Beattie's improvements. That gentleman had courageously faced the question, and was the first to direct public attention to it. He (Mr. Grantham) had, however, great hopes that some simpler means than those introduced by Mr. Beattie would be adopted. For a great many years he (Mr. Grantham) had attended the experiments of Mr. Wye Williams, and had been a party to most of the investigations made by that gentleman upon the combustion of coal, and from the experience thus derived he was of opinion that the operations so necessary in this matter would be carried on by a simpler engine than that of Mr. Beattie—combining, it might be, many of his contrivances, but doing away with a great deal that was complex.

(To be Continued.)

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*On the Co-efficients of Elasticity and Rupture in Wrought Iron, in relation to the volume of the metallic mass, its metallurgic treatment, and the axial direction of its constituent crystals.** By R. MALLET, M. Inst. C. E.

(Continued from Vol. xxxvii, page 397.)

Discussion.—It was explained that Tredgold and other experimenters only gave the absolute forces which would tear a bar asunder. In the present investigation an endeavor had been made to ascertain the amount of permanent elasticity possessed by the metal, as well as the point at which it would become actually ruptured.

It was contended that the drawings exhibited gave a very imperfect representation of the piling of the iron for large forgings, and that hence the author had been led to draw erroneous conclusions. With regard to the manufacture of the two monster mortars, 36 inches in diameter, and capable of throwing a ball weighing about 30 cwt., it was remarked that their merits as forgings were extraordinary. At first, owing to large rents in the centre of the core, the forgings were failures, but after a little experience had been gained, the second forgings were quite successful. In the manufacture of these monster guns they were built up in seven distinct layers, the forging occupying seven weeks. So far from any deterioration or crystallization taking place, the metal was improved by its long-continued heating and working; and the metal in the heart of the gun was found to be of greater strength than the bar iron of which it was composed, being perfectly homogeneous, strong, and tough. A series of experiments for testing

* From the London Civ. Eng. and Arch. Jour., April, 1859.

the correctness of the process showed that the ordinary manufacture of bar iron, by working and re-working several times, had its limits. As a proof that the deductions in the Paper were incorrect, it was asserted that engineers had one universal rule for the manufacture of forgings, whether large or small, and it was not found that the shafts of 1000 H. P. engines were more liable to fracture than those of 100 H. P. This was practical evidence that the metal was not more deteriorated in large forgings than in small from the length of time it was exposed to the action of the fire; indeed no one portion was so exposed for any great length of time. It was urged that scrap iron, or any other highly refined iron, was the worst material for the construction of large forgings. It was considered that a strong, fibrous, fresh-puddled iron was superior in every respect, as the ordinary workings required in the process of forging would be sufficient to improve it to the average maximum of strength; whereas, a highly refined iron had already reached the highest point as regarded strength, so that it was more likely to be injured by additional working. There was another reason why scrap iron should not be used for the manufacture of forgings. Scrap iron was composed of many different qualities of iron, all having their own special welding points. When worked together, one portion which was less refined was too much heated, and consequently deteriorated before the more highly refined portions were at a welding heat; so that there was the difficulty either of burning the one, or of being unable to weld the other. Again, the specimens selected by the author for trial, and which he said were weaker than the original iron composing the forging, were not taken off in the direction in which the fibre was laid for strength—in which it was intended that the strain should be borne. Now, forge masters always laid the grain of the metal in the direction in which the strain would ultimately be applied; whereas the samples experimented upon, had been cut transversely to that direction.

With regard to the new material, "puddled steel," it was believed that it was destined to work a complete revolution in almost all matters in which iron had hitherto been used. It had been proved to possess at least double the tensile strength of the best wrought iron, and the elastic limit of the material was also greater in proportion to the breaking strain. A piece of this material had been subjected to a strain of 32 tons per square inch for seventeen consecutive hours without exhibiting the slightest appearance of elongation. Subsequently, a bar 4 feet in length and 1 inch by $\frac{3}{16}$ths inch in section, had been exposed to a strain of 45 tons per square inch, when it was found that an elongation of $\frac{15}{20}$ths of an inch had taken place. Upon the weight being removed $\frac{13}{20}$ths of this elongation were recovered, showing that the elasticity of the material had not been destroyed. On another occasion the elongation amounted to $\frac{24}{100}$ths of an inch, and returned to $\frac{20}{100}$ths of an inch. Upon a second application of a strain of 56 tons per square inch the bar was broken, the elongation having been $\frac{37}{100}$ths of an inch. In other experiments the bars broke at 55, 56, and 60 tons, and one bore the enormous strain of 87 tons per square inch. To attain this favorable result, which it was believed might eventually

be accomplished as a rule, it was essential that great care should be taken in the selection of the materials, and great pains in the manufacture. It was entirely a question of good workmanship and good machinery; and a new manufacture of this sort would, for years to come, require the utmost attention and solicitude. In Germany, where this great improvement in metallurgy had been first introduced, a large number of manufacturers commenced making puddled steel; the consequence had been that an amount of bad material had been thrown upon the market, which had brought puddled steel into disrepute for a time, and from which it had scarcely yet recovered. This was to be feared in this country when the German patent had expired.

It was further contended, that if the calculations in the paper had been based upon forgings faggotted in the manner delineated in the drawings, they were of little practical utility. It was stated that large forgings weighing 20 tons, and measuring 24 inches in diameter, for engines of 1000 H. P., were now made at several places in England, without flaw or defect, except perhaps a small sand speck upon the surface, which was not of any consequence. When Nasmyth's hammer was first introduced, the plan was suggested of having the lower forge block made of a V shape, and the bottom part of the hammer so small as to strike only upon the upper centre of the periphery of the forged piece. The mass was thus struck in three places, and the tendency was to force the material to the centre, so as in fact to render the heart as solid and homogeneous as the other portions.

In reply to an inquiry as to whether the rents in large iron forgings, spoken of in the paper, would not also be liable to occur equally in the puddled steel, it was said, that in forgings of iron large crystals or grains were developed, which would not be the case in similar masses of puddled steel; and that in the latter the aggregation of grains or crystals was not increased by the agglomeration of the mass. These rents might be accounted for by the differential contraction of the metal. In the principal case referred to, the outside of the collar, which was 4 feet in diameter, cooled more quickly than the remainder of the forging, and these internal rents took place after it had left the hammerman's hand. It was stated that plates of puddled steel had already been supplied from the Mersey works for twenty-one vessels, some of them 250 tons burthen and 38 feet beam. The thickness of the plates for the vessels for Indian river navigation was one-eighth of an inch, and none had yet been made, or called for as a mercantile commodity, of greater thickness.

In conclusion, a hope was expressed that on an early occasion the subject of puddled steel would be again brought under the notice of the Institution; for, if it possessed the qualities ascribed to it, it was worthy of the most careful consideration of engineers, who had to design large railway structures, as well as for other purposes. In India and distant colonies, to which so much material had necessarily to be transported for public works, anything which would tend to reduce the weight to be carried, and consequently the freight, was a point of the highest importance. The Institution was therefore under great obligation to the author for having elicited this information.

AMERICAN PATENTS.

List of American Patents which issued from June 14, to July 5, 1859, (inclusive,) with Exemplifications.

JUNE 14.

93. Washing Machine; Pleasant Armstrong, Camden, Alabama.

Claim—1st, The arrangement of the complete stationary rounds of the convex swing frame, on two semicircular lines of different diameters, so that the rollers on the smallest semicircle shall stand above and opposite the spaces between the rollers on the largest semicircle, in combination with the arrangement of the stationary rounds of the concave. 2d, The arrangement of two auxiliary treadle standards with the main standards of the tub, in the manner described.

94. Machine for Printing Addresses, &c.; John A. Barrington, Fredericktown, Ohio.

Claim—1st, A cylinder, constructed with grooved pins, or their equivalents, for holding forms of type, presenting them at a proper point, to perform the office of printing, and afterwards allowing them to be delivered from the cylinder. 2d, In combination with the cylinder, I claim the ribs, arranged upon an endless chain in such manner as to receive the forms of type. 3d, Securing the forms within the ribs, in such manner as to present said forms properly for printing, by means of the follower, catch, and spring. 4th, Adjusting the forms of type for printing and delivering them from the cylinder after printing, by means of a reciprocating bar. 5th, The inclined feed wheel, constructed with adjustable spring conveyors, and operating as described. 6th, Regulating and adjusting the speed of the endless apron by means of the inclined disc, friction wheel, set-screws, and crank screw.

95. Gauge for Measuring the Pressure of Fluid; Victor Beaumont, City of New York.

Claim—1st, So arranging respectively dome-shaped elastic discs of one or more spring chambers in pressure gauges, as that the pressure of steam, or other fluid, within said chamber is indicated by the motion of the disc or plate, which presents its convexity to the pressure. 2d, The manner of guiding the free end of a spring, consisting of one or more chambers, expanding by pressure from within, in order to prevent it from vibrating in any direction but that of its axis. 3d, In pressure gauges with a hollow spring chamber mechanism, I claim partially filling the space inside of chambers with a solid substance or substances, in the manner set forth.

96. Instrument for Measuring the Strength of Watch Springs; J. M. Bottum, City of New York.

Claim—An arbor, having a measuring spring affixed thereto, together with an index, and an attachment for attaching the hair spring to be measured, arranged in the manner set forth, and constituting a ready means of determining the exact force of said hair springs.

97. Churn; P. S. Devlan, Reading, Pennsylvania.

Claim—The employment in a churn in which the cream is acted upon by a blast only of a float, as described.

98. Ore Separator; William O. Bourne, City of New York.

Claim—1st, A sieve-bed, in which the opening or openings for the passage of the air water through it, are so contracted as to enforce an uniform action of the air or water through the entire surface of the sieve-bed, which may be made of sheet metal, or of any textile material, either separately or in combination, or of their equivalent. 2d, The application of a vibrating and shaking motion to a sieve-bed, in combination with a blast or current of air or water, in the manner described. 3d, The described adjustable blades for agitating the substance on the sieve-bed, and for regulating the discharge of the refuse substances over the front edge of the table. 4th, The separation of metals, or other heavy substances, from ores, or other materials, when upon a sieve-bed, by the gravitation of the lighter substances towards and over the front or waste edge, when acted upon by a current of air or water through a sieve-bed, in the manner set forth.

99. Marine Hand Propeller; E. C. Brackett, Newton Corner, Massachusetts.

Claim—The arrangement and combination of the adjustable oar, arms, D, oscillating shaft, hinged blades, rods, arms, K P, rod, and lever, as described.

[A number of propellers or blades are hung to a pivoted arm which is fixed to the end of a vertical post attached to the side of the boat, and they are operated by means of an arm, connecting rod, and lever, so as to give to them a swinging or vibrating motion, at the same time the blades are so hinged as to adapt themselves to the impact of the water in an inclined position similar to the act of rowing or sculling.]

100. Valve; William Bramwell, City of New York.

Claim—The sliding nut actuated by the screw, in combination with the hinged valve and toggle links, as specified.

101. Reefing Sails; Joseph Francis Brouard, Havre de Grace, France; patented in France, Feb. 2, 1855.

Claim—1st, Supporting the rolling yard between its points of suspension by the hook, the said hook being constructed and operated for the purpose of staying the rolling yard and holding it in position when the sail attached to it is acted upon by the wind. 2d, The construction of the boom iron for the purpose of placing the boom in position to prevent the chafing of the sail, as described.

102. Projectile for Killing Whales; Robert Brown, New London, Connecticut.

Claim—The flukes on the shank of the bomb, the line attached thereto, the groove or indentation in the barrel of the bomb, for the line as stated.

103. Self-priming Locks; J. S. Butterfield and Simeon Marshall, Philadelphia, Pennsylvania.

Claim—1st, The extension on the carrier, in the manner set forth. 2d, Disconnecting each primer from the roll with the raising of the hammer, in the manner set forth. 3d, The adjustable centre projection and thumb-screw, arranged and operated in the manner set forth.

104. Method of Attaching the Capping of Fence Posts; R. S. Cadwell, Andover, Ohio.

Claim—The projection or tongue formed on the top of the post, in connexion with the mortise in the capping, for attaching the said capping to the post and securing it by a batten.

105. Mode of Fastening Letters to Signboards, &c.; Thomas Champion and Thomas Motley, Washington City, D. C.

Claim—The placing or casting on the back of letters projections with solid cast or wrought shanks therefrom. Also, holes in said projections to fasten by screws, nails, or rivets, as described.

106. Fly-trap; I. S. Clough, Brooklyn, New York, and S. R. Burrell, City of New York.

Claim—The combination of the stationary cone, revolving catcher, and start and receptacle, when constructed as described.

107. Sugar Cane Press; Thomas Crame, Port Atkinson, Wisconsin.

Claim—The combination of the pressure rollers with the main bearing wheel of a frame, which is so proportioned and supported that it can be rotated aronnd a pivot post—but this I only claim when a fluid receiving vessel, conducting tube, an annular channel, and a delivery spout, are combined with the said frame, substantially in the manner described.

108. Manufacturing Paper; S. S. Crocker and George E. Marshall, Lawrence, Massachusetts.

Claim—1st, The combination of internally heated drying cylinders with a steam box or boxes, arranged for the purpose of continuously, first, thoroughly drying paper, and then superficially moistening it, by the direct application of steam prior to the operation of calendering. 2d, The combination of a steam box or boxes, so arranged as to moisten paper superficially by the steam therein contained, with rolls which calender by pressure, as described.

109. Looms; Charles Crossley, Ellington, Connecticut.

Claim—1st, The combination of the series of vibrating tuft-formers and the vibrating reed, arranged as described. 2d, The combination of the weights, the knotted cord, and slotted arm, for the purpose of controlling the set-off of the tufting yarn beam.

110. Drain Tile Machines; Jones Daines, Birmingham, Michigan.

Claim—1st, The bar, G, and hooks, in combination with the cross-bar, when used for the purpose of opening the lid automatically. 2d, The bar, B, combined with the frames, in the manner mentioned, with the levers, for cutting off the tile by the returning of the plunger.

111. Horse Bracket; T. B. Davis, Lexington, Massachusetts.

Claim—The improved mode of fastening and confining it to the foot, by having the points of attachment bear directly upon the shoe, so as not to injure the ankle or fetlock, by galling on the hoof by compression, and also the machinery by which the bracket is adjusted to the size of the foot, and held more firmly and securely than by any other mode of attachment now known.

112. Milk Can; E. R. Denniston, Middletown, New York.

Claim—A milk can, having its cover hinged to a flanch and provided with a plate and stopper, and having the guard hoop attached to the body of the can.

113. Ploughs; Eli Moore, Slabtown, South Carolina.

Claim—The arrangement of the beam, brace, clevis, foot, stock, and ring, constructed as described.

114. Attachments to Locomotive Engines for Removing Objects from the Track; C. H. Eisenbrandt, Baltimore, Maryland.

Claim—The double suspension lifting platform, composed of the parts, the yielding network or flexible fender guard, or its equivalent, when arranged in the manner described.

115. Operating Switches on Railroads; Charles Foster, Eldridge's Hill, New Jersey.

Claim—The mode of operating switches by means of movable cams, or their equivalents, on the car, acting on a cam, or its equivalent, connected by means of levers with the switch rail.

116. Machines for Dressing Millstones; H. B. Gill, Ogden, New York.

Claim—The combination and arrangement of the pivoted segmental arm and slide with the striking lever and cam, or its equivalent, in the manner set forth.

117. Machines for Making Hay; T. I. Goff, Warren, Rhode Island.

Claim—The combination of the gathering rake and revolving rake, when arranged for joint operation, as set forth.

118. Ventilators; G. D. Greenleaf, Chateaugay, New York.

Claim—In combination with the cylinder, bell-shaped casting, and plates, the cup and register, for the purpose specified.

119. Rotary Engines; Dexter D. Hardy, Cincinnati, Ohio.

Claim—1st, The arrangement of the rings, operating in the described combination with the pipes to pack the revolving shaft in its connexion with the stationary cylinder, by the use of steam or water pressure. 2d, The combination and arrangement of the revolving shaft containing the receiving and discharge ports with the stationary cylinder and valves.

120. Horse Rakes; Henry Hersh, Lancaster, Pennsylvania.

Claim—The arrangement and combination of the S-shaped teeth, lock, revolving axle, and clearers, as described.

121. Omnibus Registers; H. C. Howells, City of New York, and J. C. Howells, Madison, Wisconsin.

Claim—1st, The employment of a yielding platform to determine the value of the entry or fare, and in combination with doors, or equivalent devices, to secure the registration of persons standing upon it, previous to their ingress or egress. 2d, The employment and use of the circular or segmental doors, or equivalent devices, having within the area of their action a yielding platform, operating as set forth. 3d, In combination with the yielding platform, an operative lever, and vertical rod, and puppet, or their equivalents. 4th, The pin or bolt, in combination with the arm attached to the vertical rod, or their equivalents, for communicating motion to the registering levers by the action of the jointed arm, as specified. 5th, The registering levers, operated as set forth, or their equivalents, and in combination with the registering ratchet wheels and the spring pawls, together with the double dial for registering the whole or half entries or fares. 6th, The stationary brushes, and the arrangement and combination of levers and rods, or their equivalents, for operating the doors and steps, as set forth.

122. Sowing Machines; Solon P. Hubbell, Unadilla, New York.

Claim—The combination of the bar having teeth, angular notches, and clearers, with hopper, its pins,

and slide blocks, arranged as set forth. Also, in combination with the hopper, pins, slide blocks, and regulating plate, the reciprocating bar, with its clearers and stirrers, arranged in the manner described.

123. TUNING KEY-BOARD; Richard Humphreys, Jonesborough, Tennessee.

Claim—The described compound tuning reeds, necessary to represent the corresponding keys in the general scale of musical notations.

[The nature of this invention is in combining on a rectangular board, any desired number of octaves of properly tuned reeds similar to those used in melodeons, to represent a corresponding number of octaves of the natural scale of musical notation (or white keys of a piano-forte), and another set of correctly tuned reeds to represent the semi-tones of the octaves in such a manner as to enable the musician, by comparing the tones of his instrument with those of the key-board, to detect and correct the least departure from the correct tone.]

124. WOOD SCREWS; Henry L. Kendall, Providence, Rhode Island.

Claim—A wood screw, having a thread of a ratchet tooth-shape, in combination with wide spaces between the convolutions thereof, on a stem cylindrical, or nearly so, and on a point of any suitable form. Also, making the threaded point of a wood screw in such a manner that the thread thereof (except the terminal convolution,) shall be of the same, or nearly the same, depth on its upper and lower sides, to give the screw a firmer hold of the wood, especially on its first entrance, than it would have if the threads on the point were made of gradually less depth toward the apex. Also, so forming the thread of a wood screw that it shall be of the same depth on the upper and under side, on the point and on the stem, (except the terminal convolution of the point, which is contracted rapidly in depth and width.)

125. BREECH-LOADING FIRE ARM; Daniel Leavitt, Chicopee, Massachusetts.

Claim—Effecting the locking and unlocking of the upwardly opening breech, and the starting of the same from its seat to open it, by means of a detached lever having a locking dog to enter a notch in the breech, and a toe to act against the bottom of the breech, as described.

[This invention consists in the employment, in combination with a breech-loading fire arm, of what the inventor calls a "combination packing," consisting of a piece of felt fitting snugly into the rear portion of the barrel, and a piece of stout paper, pasteboard, or other hard, inflexible material, of a form and size to pass easily through the barrel, the felt being placed next the breech of the fire arm, and the paper or hard material between the felt and the charge, that by the force of the explosion it may be driven back against the felt, and so caused to compress the same against the breech and spread it laterally against the sides of the chamber, and force it close against the joint, and so prevent the escape of gases and keep the joint perfectly clean. This "combination packing" is applicable to breech-loading fire arms of various constructions.]

126. SEWING MACHINES; James S. McCurdy, Brooklyn, New York.

Claim—1st, The combination of a reciprocating needle with a pair of loopers, or their equivalent, the combination as a whole operating in such manner that each successive needle loop is encircled by a tight coil of the thread of the preceding loop. 2d, The combination and arrangement of two loopers with a driver, operating in the manner described. 3d, Constructing and operating one of the loopers in such manner that a supplementary movement is imparted to it while the other is at rest, for the purpose of tightening the stitch.

127. MUSICAL INSTRUMENTS; H. T. Merrill, Galena, Illinois.

Claim—The gamut board, applied above and behind the keys, in combination with a sliding name-board, or its equivalent.

[The object of this invention is to facilitate the learning of the location of the notes and their indicative letters upon the base and treble staffs, and at the same time the association of the location of every note upon the staffs with its respective key on the key-board of a piano-forte, melodeon, organ, or other musical instrument having a key-board of a similar character. To effect this, a vertically sliding name-board, or board occupying the usual position of the name-board of a piano-forte, or similarly keyed instrument, extending the whole length of the key-board, a fixed or "staff-board," having represented on it the base and treble staffs, and the indicating letters of the notes arranged above their respective keys, are employed, the "staff-board" being so arranged behind the name-board as to be exposed by sliding up and concealed by sliding down the last-mentioned board.]

128. CULTIVATORS; Azel Smith, Westfield, Ohio.

Claim—The adjustable brace plates, frames, and cutters, when arranged as described, and in combination with the adjustable mould-boards.

129. LAMPS; Rufus S. Merrill, Lynn, Massachusetts.

Claim—In coal oil burners of otherwise ordinary construction, the combination with a flat wick tube of the removable director, constructed with inclined side walls and vertical ends, the latter being corrugated or grooved to fit the ends of the wick tube, as a means of securing the director to the wick tube, and for directing or conveying the heated vapors, mixed with atmospheric air, to the sides of the flame.

130. HANGING CARRIAGE BODIES; Leman C. Miner, Hartford, Connecticut.

Claim—1st, The application of the double-jointed shackle to the front axle, whereby the vertical position of the spring and axle is sustained, and the fifth wheel and appendages dispensed with. 2d, The back axle braces with double joints to admit a free and easy vertical motion of the springs, and supporting the axle in its upright position.

131. VULCANIZING CAOUTCHOUC; Dubois D. Parmelee, City of New York.

Claim—The preparation and use of the ingredients described, with bromine, whether combined or not with sulphur, substantially as described.

132. STEAM PRESSURE REGULATOR; A. P. Pitkin, Hartford, Connecticut.

Claim—The forming a connexion with the reduced pressure pipe or chamber, A, and diaphragm spring or piston, or their equivalents, for the purpose of opening and closing a passage, C, between the high and reduced pressure pipes or chambers, A and D, as described. Also, the combination of passage, C, piston or valve, rod, lever, diaphragm spring or piston, and safety-valve, arranged to operate in relation to each other, as described.

133. DEVICES FOR SECURING THE CLEVIS TO PLOUGHS; R. B. Pringle, Coventry, New York.

Claim—The arrangement of the pin, feather or rib, spaces, clevis, beam, and groove, as described.

134. KEYS, &c., FOR PIANO-FORTES; Joseph Hoffacker and Joseph Richards, City of New York.

Claim—1st, The construction of the key-board, by substituting, instead of the usual keys, knobs connected with the main levers. 2d, The pivoted rod, in combination with the main levers. 3d, The construc-

tion of the damper, as set forth. 4th, The construction of the trigger and its action on the damper, as described. 5th, The construction of the hammer and its action, in combination with the principal lever, as described.

135. CLIP FOR CARRIAGE THILLS; Daniel J. Riker, Harlem, New York.

Claim—Extending the plate of the carriage clip, in the form of a spring, to the eye of the shafts, and causing said spring to operate on the aforesaid eye, in the direction of the pull, to keep the parts of the bolt and eye in contact.

136. SPEEDER AND STRETCHER FLYERS; John N. Sawtell, Chicopee, Massachusetts.

Claim—A flyer for spinning frames, when constructed essentially in the manner and for the purposes set forth.

137. METHOD OF VENTILATING CORN HOUSES; Noah Seitz, Mellmore, Ohio.

Claim—The arrangement of the openings with the wire grating, in combination with the secondary perforated floor, lathing, and ventilator, as set forth.

138. SAW-SET; Alex. Shoemaker, Carey, Assignor to James G. Hunt, Reading, Ohio.

Claim—The adjustable arm with the fingers and adjusting screw, in combination with the spring trip-hammer. Also, the spring and the trip-hammer, in combination with the adjusting frame, and rollers, and adjusting screws, when arranged as set forth.

139. CONSTRUCTING SHEET METAL COFFINS; Isaac C. Shuler, Amsterdam, New York.

Claim—1st, The arrangement of strengthening the lower part of a sheet metal coffin, by folding over and soldering together, consecutively in several thicknesses, the surplus metal of the sides and ends of a sheet metal tray, forming a rim all round the outside circumference of the base, and fastening the walls of the coffin firmly thereto. Also, the arrangement of fastening to the under side of this tray or bottom of the coffin, the frames, for the purpose of stiffening it. 2d, The arrangement of placing on the inside of a sheet metal coffin a metal tray, with scrolled edges, which rests on a flanch formed by turning in the walls of the coffin all round their lower edges, and fastening this train firmly thereto, and also to the walls, for the purpose of strengthening the structure. Also, the bars for strengthening this tray. 3d, The arrangement of scrolling or folding outwardly, and soldering, consecutively, each fold of the surplus edges of the walls of a sheet metal coffin, forming a rim all round the upper edge of the walls, for the purpose of strengthening and securing the same in straight lines for jointing. 4th, The arrangement of forming on the inside of the upper edges of the walls of a sheet metal coffin, a scrolled rim on the piece, for the purpose of more firmly supporting the air-tight cover, and also for the purpose of securing the cover by screws as well as by solder when desirable. 5th, The arrangement of fastening on the outside of a sheet metal coffin, between the stiffening rims of the upper and lower edges of the walls, the studs or pillars at the corners and along the sides and ends in any required number, according to the size of the coffin, for the purpose of stiffening the sheet metal, in order that the structure may sustain a heavy weight. 6th, The arrangement of scrolling and soldering together the surplus edges of the air-tight cover of a sheet metal coffin, and beading the same, which, on being turned under, serves to fit the groove as well as to stiffen the cover. Also, the stiffening bars, as described. 7th, The arrangement of pressing a recess in the sheet metal all round the windows of a sheet metal coffin for receiving and supporting the glass. Also, the arrangement of supporting the glass by a flanch formed by the extension of a second inside sheet of the double cover. 8th, The arrangement of fastening the glass in these recesses, by means of metal sashes fastened to the coffin lid. 9th, The flanches formed on the outer edges of the sheet metal biinds, for the purpose of closing the metal sash, and securing the glass from the intrusion of dust, and from other annoyances, 10th, I am aware that I have claimed the bi-section of a hinged cover for the joint of the lid of a sheet metal coffin, according to the breaks in the side walls—I claim the cover, as applicable to a coffin with straight side walls in two hinged sections, as described.

140. SEEDING MACHINES; Andrew Simmons, Nora, Illinois.

Claim—The arrangement of the boxes in relation to the agitator, plates, and in combination therewith, the hollow drill tooth, the several parts being so constructed as to form a broad-cast seed planter and drill.

141. MACHINES FOR BINDING GRAIN IN BUNDLES; James D. Osborn, Constantine, Michigan.

Claim—A binding knot composed of three loops passed through each other, when said passing of the loops through each other is effected by machinery driven or moved from any of the moving parts of a harvesting machine, and whether accomplished by the means herein stated, or by their substantial equivalents.

142. THE CONSTRUCTION OF SLED RUNNERS; John M. Spooner, Springfield, Massachusetts.

Claim—Making both of the runners and the bearers of a sled or sleigh, or other similar vehicle, of one continuous piece or rod of steel or other metal, as set forth.

143. SEEDING MACHINES; Enos Stimson, Plainfield, Vermont.

Claim—The arrangement and combination of the shaft, F, box, E, shaft, M, arm, O, and box, N, as described.

[This invention consists in a combination and arrangement of a broad-cast and drill and hill-distributing device, whereby two different kinds of seed may be sowed simultaneously—one broad-cast, the other in hills and drills, and either allowed to be used separately when desired.]

144. BREECH-LOADING FIRE ARMS; Wm. Mount Storm, City of New York.

Claim—Such an arrangement of the links, as described, and their connexion with the breech piece and lever, that they shall jam forward and firmly hold the former against the rear of the bore of the barrel after it has ceased its motion transversely to the latter, and vice-versa, release the breech piece (in opening the breech) before its movement commences. Also, the perforated breech piece, in the manner described. Also, arranging the horn or head of the hammer, in the manner described.

145. THE RUNNING GEAR OF SLEDS; R. Sutton, East Avon, New York.

Claim—The arrangement and combination of the sliding collar, rods, reach, sliding bolster, pendants, links, and runners, as described.

146. STOP-COCK; Isaac C. Tate, New London, Connecticut.

Claim—The application of the spring, in the manner set forth, and for the purpose described.

147. WHIFFLETREE HOOKS; Lewis C. Terry, Chenango, New York.

Claim—A hook, pivoted or hinged to its supporting eye, which is cut away or flattened on its back, in the manner described, so that the point of the said hook, being in contact, or nearly so, with its said holding eye, will securely confine a link, a ring, a staple, a trace, or similar object, in all positions, excepting when turned

back upon the said flattened or eccentric part of the eye, as set forth. Also, the right, in addition to the above, to so construct the hook and eye that the hook shall have but one motion, viz: a horizontal motion directly around the circle formed by the said eye, so that the said hook shall not drop or work from side to side—and the exclusive right to use the same in either or both the forms above mentioned and described, for all purposes for which they may or can be used, when constructed as set forth.

148. Cultivators; Joseph Thirlwell, Galesburg, Illinois.

Claim—The arrangement of the frame, the iron bows, the hinge bow, the tongue braces, and lifting chain, when constructed in combination for the purposes set forth.

149. Seeding Machines; Franklin Veal, Hallettsville, Texas.

Claim—1st, The arrangement of the windlass, the hand lever, H, and the lever, N, in combination with the smoothing roller, the hopper, and the harrow, and in such relation to the driver's seat, that they can be operated from the same. 2d, The combination of the fan cylinder with the hopper, as described.

[The hopper box in this invention is arranged with a harrow and a smoothing roller in such a way that all of them, or each for itself, can be operated from the driver's seat, the hopper box being hinged and provided with a lever, whereby the box can be brought in such a position that the flap board or valve is not opened by the cam or that the same is opened for the purpose of discharging seed, and the harrow is suspended from a rope or chain in such a manner that the same can be lifted clear from the ground by means of a hand lever that can be reached from the driver's seat, and the smoothing roller is attached in such a way that it can be raised from, or lowered to, the ground by means of a windlass that is operated by a handle from the driver's seat.]

150. Railroad Car Couplings; David Warren, Gettysburgh, Pennsylvania.

Claim—The arrangement of the adjustable plate, as constructed with the pin, arm, rock shaft, and guards, when operated substantially in the manner set forth.

151. Rock Drills; Lyman White, Davenport, Iowa.

Claim—1st, Placing the bearings of the shaft to which the box and drill carriage are attached in bar, which are fitted in annular parts of the supports, and arranged so as to admit of the facile adjustment of the drill to any angle or position required. 2d, The employment or use of the racks on the bars, in connexion with the wheels on the shaft, the screws attached to the sliding bearings by the bars, the wheels on the upper ends of the screws and the pins on the cranks, arranged as shown, to feed the drill to its work.

152. Car Couplings; Gilbert Yates, West Dresden, New York.

Claim—The combination of the chains and clasps with the bent and lifting rods, grooved parts and chains, arranged in relation to each other, in the manner set forth.

153. Grain-hulling Machine; Wm. Zimmerman, Quincy, Illinois.

Claim—The conduits arranged to receive the grain scoured or operated upon by the first or each revolving scourer, when operated on a horizontal shaft, and conducted to the centre or central part of the second or next revolving scourer, and so on in succession through the whole series of scourers, until it passes out of the machine.

154. Grain Bins; Daniel D. Badger and W. S. Sampson, Assignor to Daniel D. Badger, City of New York.

Claim—The arrangement and combination of the metallic bins, in the manner described.

155. Machines for Shaping the Backs of Books; John E. Coffin, Assignor to A. G. Gerrish, Portland, Me.

Claim—1st, The arrangement of the sliding holding jaws and the reciprocating roller carriage, as described. 2d, Combining the toggle mechanism which operates the clamping jaws, and the screw which operates the roller carriage with a cam and pulley, or its equivalent, on the same shaft, in such manner as to make a machine for shaping the backs of books, which is perfectly continuous and automatic in its operation, and to and from which the books only require to be introduced and removed by the attendant at the proper stage in its operation, as described.

156. Machine for Cutting India Rubber into Threads; Joseph W. Cox, Malden, Massachusetts, Assignor to Horace H. Day, City of New York.

Claim—1st, In combination with the concave rotary cutter, the employment of a tube placed in the concavity thereof, for the discharge of a jet of water against the cutting edge. 2d, The carriage with its divided clamps and follower, in combination with a rotary cutter, or any equivalent cutter, for the purpose set forth. 3d, And finally, in combination with the carriage clamp and follower, the mechanism, or any equivalent thereof, for operating the follower, as described.

157. Machine for Boring Blind Stiles; Daniel Dunham, Assignor to D. D. Sweet, James Bromily, and E. W. French, Pawtucket, Rhode Island.

Claim—1st, The rack, or its equivalent, in combination with the sliding carriage and with the dog, as described. 2d, The lever, arranged with the nose, in such relation to the treadle that by its action the dog is operated, as specified.

158. Trip-hammers; Bennet Hotchkiss, Assignor to self and F. S. Collins, New Haven, Connecticut.

Claim—My improved means of operating the hammer, that is, by an air spring cylinder, or its equivalent, applied to the piston and combined with mechanism, by which a rapid reciprocating rectilinear motion may be imparted to such cylinder, essentially in manner and so as to operate the piston and hammer, as specified. Also, in combination with the piston trip-hammer, the air spring cylinder and the mechanism for imparting to the latter reciprocating rectilinear motions, as described, mechanism for varying the altitude of the path of movement of the cylinder, under circumstances as explained, such mechanism as above described, consisting of an eccentric bearing shaft applied in boxes, and to the crank shaft of the cylinder.

159. Composition for Cementing Iron; Job Johnson, East Brooklyn, New York, Assignor to Charles D. Archibald, London, England.

Claim—The combination and use of lime, bone dust, and charcoal, in the manner and for the purposes described.

160. Spinning Tops; Francis Milward, Assignor to H. Homan, W. L. Thomas, and D. D. Hardy, Cincinnati, Ohio.

Claim—A combined gyroscope and spinning top, constructed in the manner set forth.

161. Seeding Machines; Daniel Nichols, Assignor to Charles and Edward Rumley, Onarga, Illinois.

Claim—The combination and arrangement of hinged bars, slotted arc, driving wheels, and auxiliary seed hopper, when the same are arranged in the manner specified.

162. ROLLING METAL FOR JEWELRY; John S. Palmer, Assignor to self and Charles S. Capron, Providence, Rhode Island.

Claim—The employment of a tapering die, in combination with the pressure rollers, as specified.

163. ATTACHMENT FOR ALARM CLOCKS; E. T. Quimby, Assignor to self and Newton Brooks, New Ipswich, New Hampshire.

Claim—1st, The wheel, or its equivalent, having a series of projections, which, or some of which, can be covered up or removed, and operating in combination with the hammer, as described. 2d, The arrangement of the slides to operate in combination with the wheel and with the hammer, in the manner specified.

164. CORN HARVESTERS; George W. Richardson and James W. White, Grayville, Assignors to selves and George M. Weed, White County, Illinois.

Claim—The combination of the gathering wheels, terete rollers, stripping plates, and guide plates, as set forth. Also, the combination of the fender or guide plates, meeting the points of the rollers with the terete rollers and stripping plates, as set forth.

165. WATER-WHEEL; Robert Ross, Assignor to self and George J. Stannard, St. Albans, Vermont.

Claim—The plate or gate placed within the water passages of the wheel, provided with the vertical projections at the issues, and attached to the rod within the shaft of the wheel, as set forth.

166. RAILROAD CARS; Henry Webb, Assignor to S. L. Wilder, Cincinnati, Ohio.

Claim—The angular rail, when constructed so as to be convertible and present a new surface after the first surface has been worn out, in the manner specified.

167. MEANS FOR ACTUATING MOVABLE PARTS OF FIRE ARMS; Thomas Bailey, New Orleans, Louisiana; patented in England, December 3, 1858.

Claim—Combining a toothed wheel or pinion on a traveling centre, and working between guides with a pair of racks, one of which is stationary and the other movable, having connected to it the part of the fire arm to be moved, the toothed wheel changing its position or traveling in the same place with the guides.

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168. INSTRUMENT FOR GAUGING CASKS; John K. Barney, Warren, Rhode Island.

Claim—The calliper, the slides, the triangular calliper bracket and pins, and their combinations in the instrument, by which the true diameter at the bung of any cask can be obtained, however thick the sediment therein may be. I do not confine myself to the particular manner of fastening the parts in the instrument, but to the principles of the construction of the instrument.

169. SLIDE VALVES FOR STEAM ENGINES; R. C. Bristol, Chicago, Illinois.

Claim—The construction and arrangement of the partial rollers when sustained in their respective positions, in the manner set forth. Also, the described arrangement of the supported back-piece, loose face-piece, cut-off means, and the united passages, in the respective parts, A B, whereby the parts, A B, are allowed to work to a limited extent relatively to each other, without affecting the action of the steam, nor allowing an escape of the same through the joints. Also, in connexion with the above arrangement of the several parts, the described method of adjusting the parts, A B, relatively to each other, that is to say. working the parts, A B, for a period in a free relation, and then tightening the union by the set-screws, or their equivalents, until it becomes rigid, as described.

170. SUGAR MILLS; John Burge, Terre Haute, Indiana.

Claim—The combination and arrangement of one large and two or more small cylinders, with the strippers for stripping the leaves off the cane, and the scraper or separator for cleaning the cylinder and carrying off pressed cane, the whole constructed as described.

171. DOUBLE SEAMING MACHINE; William Burton, Cazenova, New York.

Claim—1st, The use of a working head, in combination with a disc or "former," when arranged to produce an outward or eccentric draft, and at the same time accomplish the turning down of the double seam, as set forth. 2d, The working head, in combination with the shaft, which is adjustable up and down, and supports a tapper or straight-sided "former" or disc, and with the working head frame adjustable longitudinally, as set forth.

172. BOILER; O. S. Camp, Fairfield, Iowa.

Claim—A boiler made of double walls, and a single top and bottom, said top having flanches to fit against each wall, and the communication between the interior of the inner boiler and the space between the walls being made by closed passages, such as described.

173. RAILWAY CHAIRS; Marion Carpenter, Cincinnati, Ohio.

Claim—The combination of the lugs with the base piece for sustaining the elastic cushion and its follower, in the manner set forth.

174. SUGAR MILLS; J. W. Chapman, Trinity Springs, Indiana.

Claim—The combination and arrangement of the forked lever crushing wheels, bearings and table or bed timber, the table being prepared with notches to receive the projections on the sect of the bearings and key-wedge, as set forth.

175. SHINGLE MACHINE; C. G. Conover, Jefferson, Wisconsin.

Claim—1st, The employment or use of the fence, in combination with a reciprocating splitting knife and reciprocating or shoving plate, arranged to operate as set forth. 2d, The reciprocating splitting knife, shoving plate, tapering knives, jointers, and clamp, combined and arranged to operate as specified. 3d, Operating the bolt carriage by means of the revolving arm on the shaft, and the obliquely toothed rack at the underside of the carriage, as described.

176. STRAW CUTTERS; Reuben Daniels, Woodstock, Vermont.

Claim—1st, The combination with the roller of the convex teeth, having the major diameter of their bases arranged parallel with the axis of the roller, as described. 2d, The arrangement and combination of the roller, cutter, and cylinders, as described.

177. HULLING CLOVER; Nathaniel Eames, Hanover, Pennsylvania.

Claim—The combination of the screen with the cylinder, when said cylinder is provided with a spiral groove and a spiral strip of rubber, constructed in the manner specified.

178. Converting Reciprocating into Alternate Circular Motion; Henry Ehrenfeld, City of New York.

Claim—1st, Arranging the lever and dog, in combination with the grooved wheel, or its equivalent, in such a manner that the dog acts on the wheel entirely independent from the centre or hub of the wheel, and that the lever can be brought in such a position as to impart motion to the wheel, in either direction, as specified. 2d, In combination with the lever, dog, and wheel, I claim the arrangement of the groove, or its equivalent, in the hub of the wheel, for the purpose of keeping the dog in the proper position, and to prevent the lever from tipping over sidewise, as specified.

179. Cheese Presses; A. H. Emery, Mexico, New York.

Claim—The method of moving the follower upwards, by means of the weight, the cords, and the pulleys, arranged as described. Also, the arrangement of the arm, the ratchet, the pinion, the crank arm, together with the wheel, with the cogs either on the inside or outside, arranged as described.

180. Sash Fasteners; A. H. Emery, Mexico, New York.

Claim—The construction of a window sash spring and fastener of drawn pipe, with the end, g, and the end, h, arranged and fastened therein, as described. Also, the construction of the knob-rod or bolt, as described.

181. Attachment of Handles to Tin Pails; Thomas Evans, Watkins, New York.

Claim—Forming metallic ears for pails, buckets, and other vessels, with concentric angular corrugations surrounding the bail orifice, in combination with the flattened hook, the end of the bail, provided with an additional bearing against the surface of one or more of said corrugations, and the drop opening or downward continuation of the outer corrugation, in the manner described.

182. Corn Planters; P. H. Freylinghousen and J. G. Heilman, Johnstown, Pennsylvania.

Claim—The perforated wheels, G, when hung to the sliding bars, and situated in respect to the hopper, and wheels, H, and otherwise arranged as set forth, so that on moving the said bars inwards, the wheels, G, may be drawn out of gear, and the orifices of the hopper at the same time closed by the wheels.

183. Roll for Forming Tires; J. H. Gage, Nashua, New Hampshire.

Claim—The combination of the flanch, B, recess or depression, O, wide shoulder or tread, L, flanch, C, and short shoulder, D, with a series of thin metallic discs, said parts being constructed relatively to each other, in the manner set forth.

184. Retorts for Distilling Coal Oils; H. P. Gengembre, Alleghany, Pennsylvania.

Claim—1st, The use of an L-shaped retort combined with charging boxes, crusher, and discharging tube, capable of being subjected to a degree of temperature at the end of the horizontal part at which the residuum of the substance under treatment is discharged higher than at the upright part at which the coal is charged, the whole so arranged as to avoid the admission of atmospheric air. 2d, The combination with my retort, constructed as described, of a crusher suited to the material to be distilled, placed within the retort at a point intermediate between the points where the heat is highest and lowest, for the purpose of breaking up the coal, or other substance, before the process of distillation is complete.

185. Sewing Machines; H. H. Goodwyn, New Orleans, Louisiana.

Claim—1st, The combination of the loosely fitted double conical sleeve with the soft leather or elastic backed and bearing eye, and a spring pressure, whereby the spool is brought to a proper centre, and the requisite tension produced, the cone sleeve revolving simultaneously with the spool and pivoted arm, and the friction or tension being obtained by the action of the outer end of the double cone against the elastic eye, in the manner described. 2d, The arrangement with the above of the peculiar spring pressure described, consisting of the pivoted or rocking standard, rod, spring, and rosette or nut, for operation together and with the spool, in the manner described. 3d, The attachment to the stationary shell or outer case of the tension arm, in the manner described. 4th, Hanging the bobbin on, and so as to rotate together with, a cylinder, when the same is combined with a spring inducing friction in the run of the bobbin, and operating in connexion with a tension arm or elbow acting on the thread from the bobbin, as described.

186. Apparatus for Heating Buildings; S. F. Gold, Cornwall, Connecticut.

Claim—Constructing the generator of a series of similar cast metal sections, each complete in itself, and united substantially as described, so that the capacity of the generator will be governed by the number of sections used, and may be increased or diminished by adding or removing any desired number of the internal sections. Also, constructing these sections so that when united, there will exist the chambers rising above the water line and out of the draft of the furnace, as set forth. Further, in combination with the generator, the supplementary steam chambers made up of flat cast metal sections, as specified.

187. Tanning; Jacob Gove, Milford, New Hampshire.

Claim—Stirring the liquor or tanning fluid in the vat by means of a stirrer, constructed, arranged, and operated in the manner set forth.

188. Machine for Chamfering Barrel Heads; John Greenwood, Rochester, New York.

Claim—The arrangement of the sliding frame, clamps, cam, lever, and gearing, in connexion with the circular dish-shaped saw and cutters, arranged for joint operation, as specified.

189. Electro-magnetic Machine; Thomas Hall, Boston, Massachusetts.

Claim—The combination of the spring connecting bar and the switch, placed between the machine and the battery, and operating with reference to each other, as described.

190. Connecting the Iron Girders of Bridges; Joel T. Ham, Covington, Kentucky.

Claim—1st, Combining the posts and braces with the cords by means of the metal saddles, and the metal stirrups or straps, applied as described, whereby the expansion and contraction of the cords, posts, and braces, by changes of temperature, is provided for. 2d, The india rubber blocks or springs, applied between metal blocks, in combination with the saddles and stirrups, as set forth.

191. Guard Fingers for Harvesters; A. Hotchkiss, Sharon, Connecticut, and John P. Adriance, City of New York.

Claim—1st, The angular cavity for the free admission of the front end of the face plate to permit its shoulders, at the rear end, to be inserted, whereby the ends of said plate are firmly secured, in the manner specified. 2d, Confining the back end, c″, of the steel face plate, by bending down the metal of the finger upon the reversely beveled edges of c″, in the manner described.

192. Trace Fastener; Daniel H. Hull, Plantsville, Connecticut.

Claim—The combination and arrangement of metal plate, spring latch, spring, and knob, in the manner set forth.

193. SNOW PLOUGHS FOR RAILROADS; W S. Huntington, Andrewsville, New York.

Claim—The employment or use of the plates or scrapers attached to arms of the shafts, which shafts have springs attached, and are connected to an adjusting bar by means of the arms and rods, the whole being applied to a car, and arranged to operate as set forth.

194. TOOLS FOR FASTENING BALE HOOPS; E. A. Jeffrey, Corning, New York.

Claim—1st, The employment or use of the combined pliers and die, arranged as set forth. 2d, The combination of the pliers and hammer with the pliers and die, arranged for joint operation, as described.

195. CHAMFERING TOOL; Wm. Johnson, Jr., Hampstead, New Hampshire.

Claim—Supporting the knife and adjusting it with reference to the sole rest and the edge bearer, viz: by means of a carrier and adjusting screws, applied and arranged with respect to the sole rest, the edge bearer, and the presser, as described.

196. APPARATUS FOR CUTTING TEETH IN SAWS; K. H. Kinne, Mexico, New York.

Claim—The movable curved switch, in conjunction with the curved groove, for the purpose of adapting the machine to the cutting of teeth, on setting or sharpening the teeth of straight as well as circular saws. Also, operating and feeding the burr, by means of the shaft turning within the hollow screw shaft, when applied to a saw sharpener, in the manner described. Also, the bed-piece or anvil, for the purpose of supporting the saw teeth while being sharpened. Also, in combination with the burr and the anvil, the clamps for gauging and firmly holding the saw whilst being acted upon, as described.

197. SHIP'S CAPSTAN; David Knowlton, Camden, Maine.

Claim—Fixing the shafts of the stud gears in a revolving plate arranged to turn with the barrel and head when they are locked together, and to be stationary when they are unlocked, in combination with two stud gears, by which the head and barrel are turned in the same direction when used as a geared or simple capstan.

198. EXHIBITION ROCKET; Andrews Lanergan, Boston, Massachusetts.

Claim—Making the rocket with a match arranged and fixed in the choke, and protected or covered by a plane or thin disc, having no opening into the choke, nor any cavity or recess to hold the match or catch sparks. And I particularly claim attaching the match, as described, to the inner surface or side of the choke, or arranging the attachment therein, and with respect to the lower end of the match, the same not only enabling the match to be confined to the choke of the rocket, but to have a portion of it, after breakage of the cap, capable of being bent downward out of the choke into a convenient position for being fired.

199. SLED BRAKE; Albertus Larrowe, Cohocton, New York.

Claim--1st, Constructing the brake eyes in the peculiar form shown and described. 2d, The combination of the brake eyes with the brake, as described.

200. WHIP AND LINE-HOLDER FOR GUIDING HORSES WITHOUT THE USE OF THE HANDS; Lucius Leavenworth, Trumansburg, New York.

Claim—The arrangement of the rein-hooks or knobs which are united by one or more cross-bars or braces, and which are provided with a whip-socket, or without the same, in such a manner that a frame is formed, which, by the aid of suitable shoulder straps, or their equivalents, may be secured to the body of a person, as described.

201. CORK MACHINE; Harvey Locke, South Boston, Massachusetts.

Claim—1st, The employment or use of a reciprocating knife-stock, when provided with necessary knives, and arranged in combination with a rotating mandrel, traversing clamp, and feed-spout or trough, so that as the knife-stock moves back and forth pieces of cork will be cut from the bar or slab, and said pieces turned in suitable conical form. 2d, In connexion with the reciprocating knife-stock, attaching the mandrel and head to an adjustable bar fitted in the framing, and arranged so as to admit of the adjusting of the pieces of cork more or less obliquely with the knife, and vary the taper of the corks as may be desired. 3d, Placing the clamp in a reciprocating plate operated by the lever, Q, from the wheel, and the lever, R, from the reciprocating knife-stock, E, for the purpose of giving the traversing movement to said clamp to convey the pieces of cork from the jaws to the mandrel.

202. WIND-MILLS; James K. Lum, Skookumchuck, W. T.

Claim—The employment or use of the fly or frame placed on the arbor, and having the ends of the cord passing through it, and attached to said arbor, said cords being also attached to the rope of the weight, the fly being operated by the wind-wheel, in such manner as to admit of a simultaneous rotation of the arbor.

203. GRINDING MILLS; J. C. Lyons, Auburn, and Henry F. Phillips, Seneca Falls, New York.

Claim—1st, The arrangement and combination of the clasp, pin, screw, hand-wheel, and shaft, whereby the said shaft and grinding cone may be readily adjusted and firmly secured, whether the machine is in operation or at rest. 2d, The arrangement and combination of the double-flanched pulley, shaft, fork, rod, and shell, as described, so that by the adjustment of the shaft, the shell will also be adjusted.

[By the use of this mill grain may be ground finer or coarser, as desired, for the hub of the hand-wheel is provided with a screw, that is placed in such connexion with the grinding cone and corn-cracker that by turning the hand-wheel the shaft receives a longitudinal sliding motion that adjusts the cone to grind to any degree of fineness, and its free rotation is not interfered with.]

204. POTATO DIGGERS; Perry Marcy, Tunkhannock, Pennsylvania.

Claim—The arrangement of the inclined smooth belt, tightening pulley, shield, ratchet wheel, levers, and bars, provided with teeth, constructed in the manner set forth.

205. CONSTRUCTION OF DRIVING SHAFTS FOR MILLS, COTTON GINS, &c.; James Massey, Thomasville, Georgia.

Claim—Suspending the driving shaft, in the manner described, to allow it to rise or fall with the floor, to which it is attached, operating substantially in the manner set forth.

206. DRAINAGE PIPE; Thomas J. Mayall, Roxbury, Massachusetts.

Claim—Combining with a stationary washing bowl sink, washing tub, or other similar articles, the elastic drainage pipe terminating in a wedge-shape, in the manner described.

207. CORN AND CANE HARVESTERS; H. D. McGeorge and D. C. Greer, Morgantown, Virginia.

Claim—Providing a corn or cane harvester with a vertical reciprocating cutting apparatus, for the purpose of cutting the stalks into two or more pieces, in the manner described.

208. MACHINES FOR SAWING STONE; Andrews T. Merriman, Chicago, Illinois.

Claim—The lowering the saw frame by means of the long screws acting on the sliding bars, and the stiff

connecting rods hung with hinge joints at the saw frame, and the sliding bars (instead of chains or ropes), for the purpose of holding the saw frame steady and prevent any jumping motion.

209. Window Curtain Fixture; Purches Miles, New Britain, Connecticut.

Claim—1st, The compound hanging bracket, capable of being raised up to permit the opening and closing of blinds, or for other purposes. 2d, Constructing and combining the parts, as described, so that the bracket can be attached to the top, side, or back of the window frame, and at either side of the window. 3d, Holding the band against a pulley having a friction surface by an arm or arms, as set forth.

210. Corrugating Metallic Sheets; Richard Montgomery, City of New York.

Claim—The waved corrugated wrought metal plate for boilers, in combination with the margins of greater thickness than its middle, as described.

211. Instrument for Adding Numbers; John B. Newbrough, St. Louis, Missouri.

Claim—1st, The bent arm underlying the dial, so as to operate it without obstructing the vision. 2d, The stud, operating in the described connexion with the pawl to permit the backward motion of the dial, for the purpose set forth. 3d, The combination and arrangement of the rib, cavity, catch, and teeth, operating as explained, to shift the obstructing plate at each revolution of the dial, and arrest the reverse motion of the latter at the right instant in setting the machine. 4th, The described arrangement and combination of the pins and hook, operating in the manner set forth.

212. Machines for Harvesting Beans; S. Van Rensselaer Newman, Covington, New York.

Claim—1st, The employment or use of the rotary sickles, provided with scolloped-shaped teeth, and arranged to operate as set forth. 2d, The combination of the endless chain of rods with the rotary sickles. 3d, The combination of the rotary sickles, endless chain of rods, platform, with or without the rake, placed in a mounted frame, and arranged for joint operation.

213. Fire-back for Stoves and Fire-places; Andrew O'Neill, Portsmouth, Ohio.

Claim—The hooded damper, in combination with a radiating fire-back, arranged as described.

214. Cultivators; James Peeler, Tallahasse, Florida.

Claim—The arrangement of the bars, D and E, beam, handles, and standard, the bar, E, forming a brace, a coulter, and a landside, and the bar, D, being provided with an inclined or tapering point, on which any style of blade may be secured, the two bars being pivoted together, and the whole operating in the manner specified.

215. Machines for Cutting Sugar Cane; Albert Philipp, Mayville, Wisconsin.

Claim—The arrangement of the cutters, H′, with the forked arms, I′, and with the endless apron, in combination with the cutters, H, the forked arms, I, the reels, and the additional platforms, to operate in the manner specified.

216. Apparatus for Manufacture of Paper Pulp; Joseph B. Palser and Gardner Howland, Fort Edward, New York.

Claim—1st, Having the pipe, b, which passes through the hollow journal of the boiler, divided by a partition, so that the steam may find exit through one compartment of the pipe, and the contents of the boiler through the other compartment. 2d, The employment of the perforated diaphragm, when arranged as described, to protect the pipes, h h′ s s′, and strain the liquids from the "stock." 3d, The arrangement of the boilers, J J′, with the surrounding envelope, as described, so that the resultant liquids of the boiling may be evaporated, and also employed to cool down the boilers and surrounding envelope. 4th, The arrangement of the basin below the boiler to receive the falling liquid, as described. 5th, The injection of the steam arising from the boiling of the alkaline and other contents of boiler, J′, into boiler, J, and vice-versa, as described. 6th, The arrangement of the warming chamber between the two boilers, and the combination therewith of the pipes, T V W W′, as described. 7th, The arrangement and combination of the boilers, furnace, and doors, so as to apply the furnace heat to either or both boilers at pleasure, as described. 8th, The combination of the cylindrical bottomed vats, having the chimneys passing through them, with the boilers, as described.

217. Machines for Sowing Fertilizers; James Peeler, Talahassee, Florida.

Claim—The arrangement of the frame, wheels, axle, and apron, attached to the frame by means of straps, with the bar, metallic strip, corrugated wheel, bar, chuck, hopper, and slide, the whole being constructed and placed in the relative positions set forth.

218. Brakes for Power Looms; Rensselaer and Gordon B. Reynolds, Stockport, New York; ante-dated Feb. 8, 1859.

Claim—Applying and arranging the two faces of the brake relatively to its centre of motion, and the said centre of motion relatively to the centres of the crank and cam shafts, in the manner described, whereby the brake is not only rendered automatic in case of recoil after the stoppage of the loom by the action of the protector, but self-liberating when the loom is started again.

219. Filter; Wm. Rice, Philadelphia, Pennsylvania.

Claim—1st, The general arrangement of the two casings, the perforated plates, the wire gauze, body of sand, the system of pipes, and three cocks, as described. 2d, Confining a body of sand between the perforated plates, by means of a ring, constructed in the manner set forth, or any equivalent thereto, by which the said ring may be made to compress the body of sand without disturbing the said perforated plates. 3d, The orifices at the lower ends of the pipes, for the purpose specified.

220. Cider Presses; Christian Ritter, Reading, Pennsylvania.

Claim—The application of the chamfered and grooved inner slats and partitions, with their fastenings and arrangements, which will produce the intended effect.

221. Brush for Washing Windows; Philip C. Rowe, Boston, Massachusetts.

Claim—The hydraulic window-washer or brush, constructed with the spray-jet tube, and the conduit or pipe applied to its stock and handle, in manner as specified.

222. Cooking Ranges; Wm. G. Ruggles, Worcester, Massachusetts.

Claim—The arrangement and combination of the oven, D, provided with a central hollow shelf, b, the oven, G, provided with a hollow shelf, m, fire chamber, B, damper, E, chambers, h d, flues, C H n n′, as described.

223. Door Frames for Furnaces; Paul A. Sabbaton, Albany, New York.

Claim—The combination of the mouth of the furnace of the door frame and door, when the said door

frame is provided with an opening larger than the door into which the door shuts, so as to close against the furnace or against a shield or false frame, as described.

224. Tool for Planing and Finishing the Edges of Boot and Shoe Soles; Henry Sauerbier, Newark, New Jersey.

Claim—The combination of the collis and edge plane, in the manner specified.

225. Harvesting Machines; Wm. and Thomas Schnebly, Hackensack, New Jersey.

Claim—The arrangement and combination of the inclined tapering discharge trough, with the concave or curved platform and raker-reel, whereby the grain is made to fall from the machine in compact gavels, as described.

226. Harvesting Machines; Wm. and Thomas Schnebly, Hackensack, New Jersey.

Claim—The employment, in combination with the pendulous levers, d d′, of the toggle levers, g g, as shown, whereby the levers, d d′, may, without shifting their axes of motion, be thrown in or out of connexion with the drivers.

227. Water-wheel; Jonas Smith, Westport, Connecticut.

Claim—The arrangement and combination of the annular gate, when provided with the tangential vertical plates, stationary rim, interposed between the gate, and wheel, when provided with buckets having lips, all as described.

[To that class of horizontal water-wheels called "centre discharge wheels," this invention will be found to be applicable. The invention consists in the employment of a circular gate, formed of a series of guide passages, and placed over or around a stationary rim having induction openings made in it, the wheel having peculiar buckets—the whole is so arranged that the admission of water to the wheel may be regulated as desired with great nicety, and in such a way that the greatest effect will be produced from a given volume of water, whether it be large or small.]

228. Measuring Faucets; Joseph Smith, Cincinnati, Ohio, and G. B. Griffin, Madison, Wisconsin.

Claim—1st, Operating the plunger by means of the cam grooves on the face of wheel, in connexion with the pins on the sleeve, when both are constructed and operated in the manner set forth. 2d, The serrated circular register plate, in connexion with the ratchet and pointer, in the manner specified. 3d, The disc, constructed as described, in combination with the inlet pipe and the outlet pipe.

229. Machine for Jointing Staves; John G. Stephenson, Buffalo, New York.

Claim—The adjustable plates with yielding cutter stocks or plates attached in connexion with the feed rollers and yielding pressure plate, or its equivalent, arranged to operate as set forth.

230. Cultivators; J. C. Stoddard, Worcester, Massachusetts.

Claim—The arrangement and combination of the slotted, adjustable, reversible blades, arms, and hub, as described.

231. Panoramic Attachment for Clocks to Indicate the Comparative Time in all Longitudes; Giles M. Stone, Fredericksburgh, Virginia.

Claim—1st, The chronometer dial divided off into 24 equal parts for indicating the 24 hours of day and night, by one revolution of the index point. 2d, The revolving disc representing the northern or southern hemisphere, for indicating the relative time of day or night, at any and all localities thereon. 3d, The combination of the revolving disc with the 24 hour dial, for demonstrating the cause of day and night by the diurnal revolutions of the former, representing the revolutions of the earth on its own axis.

232. Combined Case for Pen, Pencil, Knife, Toothpick, &c.; John F. Sturdy, Attleborough, Massachusetts.

Claim—The case, constructed as shown, and provided with the blade knife, operated by the spirally slotted tube, pencil tube, toothpick, and pen-slide.

233. Clothes Pin; William H. Towers, City of New York.

Claim—A clothes clamp, formed of two parts jointed together at their upper ends, as set forth.

234. Apparatus to Hold and Turn the Leaves of Books and Music; Cyrus B. Thayer, Boston, Mass.

Claim—The combination and arrangement of the wedge-acting back pieces and clamps with their connecting dovetail tongues and grooves, so that simply raising the clamps shall unclamp and depress them, shall clamp the music sheets. Also, the arrangement and combination of the leaf-turning cords, arms, lever, and catch.

235. Machines for Digging Potatoes; George F. Tiffany, Palmyra, Michigan.

Claim—The hinged fork, in combination with the plough, arranged as set forth.

[In front of the cart body an adjustable plough is placed, constructed with closed sides, and operating by means of a wheel placed in front of it, so as to be self-adjusting while passing over the potato hills, adapting itself to the various depths of hills, and ploughing up the potatoes and sending them on to an endless riddle, where the dirt is cleaned off them.

236. Manufacture of Gas; Charles N. Tyler, Washington City, D. C.

Claim—Combining hydrogen gas with the volatile and easily condensible products of coal, resin, tar, &c., in their nascent state, in the manner set forth.

237. Cultivators; Franklin Veal, Hallettsville, Texas.

Claim—Arranging the dovetailed projection at equal distances from the cutting edges of the shares, in combination with the slots and receses in the arms, and for the purpose of securing the shares to the arms, and to render them reversible.

[This cultivator is especially adapted for hilling and weeding young crops of cotton, corn, or root crops, as it runs between two rows, throwing up the ground on each side, or it straddles two rows by a proper adjustment of the shares.]

238. Screw Propeller; Jules Jean Baptiste Vergne, Paris, France.

Claim—The arrangement of the grooving fluting or ribs in the form of a series of steps, as described.

239. Fluid Lamps; Anton Von Schuttenback, St. Petersburgh, Russia; patented in England, Oct. 11, 1858.

Claim—The combination of the gas-holder or gasometer, the vessel, the pipe, n, with its branches, the pipe, f, the chamber, the chimney, the oil reservoir, and the burner, the whole being applied as specified.

240. Gas Retorts; Edward Walcott, Providence, Rhode Island.

Claim—1st, The combinatiou with the lid of the projecting incline plane, as described. 2d, The employ-

ment for securing the lid of the mouth-piece of the retort in place of a horizontal eccentric or cam and lever, attached to, and combined with, a cross-bar, and applied to the mouth-piece of the retort, as described.

241. Railroad Car Seats; F. F. Wagner and P. P. Dickinson, Harrisburgh, Pennsylvania.

Claim—The arrangement and combination of the wheels, arms, cushions, and bars, as described.

[This invention consists in arranging on each side of the seat two cushions which fold one on the top of the other, and which are attached to arms that are connected by a series of gear wheels in such a manner that the cushions attached to one side of the seat are always situated on a plane parallel to the plane which passes through the cushions on the other side, so that when the cushions on one side are used for the back of the seat, those on the other form leg rests, and vice-versa, and by bringing the cushions in a horizontal position the seats are changed into sleeping couches.]

242. Body Bolsters for Railway Cars; Ambrose Ward, Altoona, Pennsylvania.

Claim—1st, The arrangement and combination of the trusses, centre plate, D, sills, and tension rods, as described. 2d, Providing the centre plate, D, with lugs, protecting flanch, or cap, lateral bearing flanch at the centre fitting into cup in plate, B, the vertical bearing flanch fitting into the cup or groove in plate, B, arranged as described.

[The centre plates are so arranged that the lateral friction between the upper and lower centre plate is reduced to a very small diameter, and sufficient room is obtained for circulating the oil or lubricating matter, and at the same time the dirt is excluded by means of a flanch attached to the upper plate and fitting over the lower one, and struts are cast to the upper centre plate in such a manner that they form steps for the truss timbers, and the downward pressure on either side of the car is sustained by the outer rings of the centre plates.]

243. Method of Opening and Closing Farm Gates; David Warren, Gettysburgh, Pennsylvania.

Claim—The arrangement of the lever and bar, d, with the bar, E, and falling catch, constructed in the manner described.

244. Cultivators; Henry Wells, Walnut Grove, Illinois.

Claim—The arrangement of the share, mould-boards. rods, H H and I I, the latter having the parts, d d, formed on them, the said parts passing respectively through the bar and beam, thus making a very firm structure, in the manner set forth.

245. Trace Fastener; Solon R. Atkins and D. H. Hull, Assignors to D. H. Hull, Plantsville, Connecticut.

Claim—The metallic box, having a semicircular ring on its end, and provided with a slide which is to be operated by a knob, and held against the neck of the button on the whiffle-tree by springs, arranged in the manner set forth.

246. Device for Feeding Bees; Wm. Brown, Assignor to self and Fontain G. Robertson, Shelbyville, Ind

Claim—The bottle-stopper, consisting of the cork, tube, and cup, secured together by the screw and nut, as described.

247. Heels for Boots and Shoes; Walter Hunt, City of New York.

Claim—Making the external form of the heels of boots and shoes of a metallic shell with an inner flanch at the upper edge, to fit over the usual heel seat of the sole and between that and the counter or back portion of the upper, and to be provided with an inner core, and the whole to be secured to the heel seat. Also, in combination with the shell, and upper flanch, and inner core, making the said shell with an inner flanch at the lower edge. Also, in combination with a heel, constructed as above described, and consisting of the shell with the upper and lower flanches and the enclosed core, the employment of a rotating top lift, as specified.

248. Water Gauges for Steam Boilers; Robert H. Mathies, Boston, Assignor to A. N. Clark, Beverly, Mass.

Claim—The combination, with the partition that separates the upper and lower main tubes, of the gauge of the independent steam and water tubes or courses, arranged to unite the spaces in the main tube, as specified.

249. Double Cannon for Chain Shot; Wm. M. Jeffers, Assignor to self and Wm. L. Gibson, Elmira, N. Y.

Claim—The use of a partition intermediate between the breech and muzzle of the piece, in combination with the slot, so arranged that the charge of the barrels shall mingle at the fuse, so that immediately on the ignition thereof the expansive force shall be wholly expended in projecting the two balls, and not weakened by a continuous connexion between the barrels.

250. Water Gauges for Steam Boilers; H. K. Moore, Malden, Assignor to A. W. Adams and G. W. Dane, Boston, and Wm. G. Howe, Haverhill, Massachusetts.

I do not claim the single balanced valve apparatus, constructed with the arrangement of steam-receiving and discharging chambers, hollow stem or passage, external steam passage, and parts, d d. But I

Claim—Combining therewith the auxiliary steam space, and the nipple or raised valve seats, arranged as specified.

251. Cheese Cover; E. L. Pratt, Assignor to self and R. B. Fitts, Philadelphia, Pennsylvania.

Claim—As an improved article of manufacture, for the purposes described, a ventilating cover constructed of tin plate, or other suitable material, so as to protect articles placed therein from the rays of light and heat, and the ravages of animals or insects, and at the same time secure perfect ventilation, by means of a series of small perforations at or near the base or bottom for the inlet of cool air, and another series of perforations at or near the top for the escape of warm air moisture and gases.

252. Railroad Turn-tables; Archibald and James H. Putnam, Assignors to selves and Philip S. Geisse, Wellsville, Ohio.

Claim—The adjustable spindle, applied and adapted in the manner set forth.

253. Lock Guard; Lawrence Schroder, Assignor to John H. Schroder & Co., Cincinnati, Ohio.

Claim—The arrangement of the several tumblers, in combination with intervening springs, which vary the spaces between said tumblers and operate the lock, in the manner set forth.

254. Gas Retorts; John W. Smith, Washington City, D. C., Assignor to self and Jesse H. Whitehurst, Baltimore, Maryland.

Claim—The described arrangement of the pipes, e and e′, when combined with the retort and condensing chamber, in the manner set forth.

255. Smelting Furnace for Iron; Robert Wm. Sievier, Upper Holloway, Middlesex Co., England, Assignor to Wm. Lilley, Ohio.

Claim—The use of the exhaust pipe in connexion with a fan pump, or other means, to exhaust the foul

air and gases, and cause a current of air to pass through the bottom or apertures of the furnace of sufficient density for the smelting and purifying iron and other ores, in the manner set forth. Also, the exhaust fan, constructed and operating as explained. Further, the use of the movable crucible, as described.

256. Edge Plane for Boots and Shoes; Benjamin Tolman, Assignor to self and Asa F. Ramsdell, Pembroke, Massachusetts.

Claim—The improved edge plane, as constructed, with cutter and gauge bearings, flanches, and confining devices arranged on the stock, and with respect to the cutter and gauge, as specified.

257. Patterns for Casting Stove Covers; Charles Teuesdale and A. J. Sennett, Assignors to Wm. and Jacob Resor, Cincinnati, Ohio.

Claim—Constructing patterns for stove covers and centres, with an opening in their under sides, by means of which a draw bar may be withdrawn from the mould before removing the pattern, and also with a perforation, as set forth.

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258. Constructing Rims and Field-pieces for Watch and Locket Cases; J. N. Allen, Providence, R. I.

Claim—Making the rim and field-piece for watch or locket cases from a strip of sheet metal, as described.

259. Vapor Lamp Burners; C. M. Alexander, New Albany, Indiana.

Claim—The combination of a retort having converging sides, and constructed in the manner set forth, with an inlet pipe and an outlet pipe, and a burner, for the purpose of forming a gas generating apparatus, to be used in connexion with fluid lamps.

260. Seeding Machines; J. C. Bean, Grayville, Illinois.

Claim—The arrangement of the hopper and arms, in combination with the inclined equalizer, as set forth.

261. Gas Retorts; William Beaumont, Paterson, New Jersey.

Claim—Making all that part of a retort which is most subject to expansion and contraction, corrugated to prevent fracture.

262. Contrivance by which the Workman Operates Scroll Saws; Edward Beck, Allentown, Pennsylvania.

Claim—The oscillating platform connected with the shaft by means of the straps and pulley, or their equivalents, the arm, pitman, and spring, arranged for joint operation as set forth.

263. Railroad Bars or Rails; Henry Betts, Hamilton, C. W.

Claim—The angle rail, in combination with the outside bar, where the space between them is filled in with cement, prepared by boiling sand and coal tar, in such proportions as will best resist the action of the elements, cold, heat, and moisture, and the wear of the wheels.

264. Fire-proof Desk; M. B. Bigelow and Anson Hardy, Boston, Massachusetts.

Claim—The movable table, or any device essentially the same, in combination with the fire-proof case, said table being constructed and made so as to operate in the manner specified. Also, the slide, or any device essentially the same, in combination with the movable table and the fire-proof case, for supporting or assisting to support said movable table, whenever said table is drawn out to the position shown in fig. 2, said slide and table being connected and made so as to operate in the manner specified. Also, the brackets, or any device substantially the same, in combination with the fire-proof case for supporting, or assisting to support, the movable table and the slide, in the manner explained.

265. Spring Hinge; Nelson Birdsall, Port Jervis, New York.

Claim—The combination and arrangement of the spring and adjusting piece applied to a hinge, as described. Also, inserting within the spiral spring the tubular spring, as described, for assisting the action of the spiral spring, and preventing it from setting or getting out of place with the other parts.

266. Ploughs; L. E. Burdin, Paris, Kentucky.

Claim—The arrangement of the beam, the handles, the standard, brace, H, share, landside, cone, spindle, or shaft, braces, C and G, and lug, as described.

267. Corn Planters; Alexander, William, and James Campbell, Harrison, Ohio.

Claim—The described arrangement of the inclined slides or valves, levers, adjustable rods, and cam wheel.

268. Job and Card Printing Press; J. A. Campbell, New Orleans, Louisiana.

Claim—Fastening the cylinder permanently on its solid axle, and also fastening the ends of this axle securely into the slides. Also, in combination with the cylinder, the revolving of the roller frame on the solid axle as its working centre, while the axle itself does not revolve either by eccentric wheels, which are to be used when the cylinder vibrates, or by plain ones when it is stationary. Also, the eccentric wheels, in combination with the cylinder. Also, the cranks, R, and connecting rods, D, in combination with the cylinder, the inking frame, and the eccentric wheels. Also, the combination of the cranks, S, the connecting rods, T, the slots, the pins, and the bottoms, with this press, as specified.

269. Stoves; W. J. Cantelo, Burlington, New Jersey.

Claim—The exterior casing and inner adjustable casing, in combination with the fire-pot and cone-shaped grate, when the several parts are arranged as set forth.

270. Machines for Hoisting Bricks; T. F. Christman, Wilson, North Carolina.

Claim—The combination of the rollers, D D, with the saddle and buckets, E F, supported by rollers, J J, as set forth.

271. Seed Planters; Giles Cramton, Marshall, Michigan.

Claim—The application and use of the pulleys, in combination with the adjustable hanger, tension bar, lever, and yoke, with its attached spring stops, arranged as specified.

272. Machines for Sowing Fertilizers in Drills; C. B. Davis, Lawrenceburgh, Tennessee.

Claim—The arrangement of the hopper, wheels, frame, handles, D D, shoe, E, handle of shoe, H, pins on wheel, and axle-trees, as described.

273. Apparatus for Purifying Gas; Aurelius Dickinson, Claremont, New Hampshire.

Claim—The washer, constructed with horizontal plates, corrugated or with the bottoms partly or wholly concave, and with upright plates projecting above and below the said plates, and dipping into the water below the said plates, and with orifices so arranged in the highest portions of the said horizontal plate, as to cause the collection of the gas in the concave portions of the said plates, below and around said orifices.

274. Bases for Artificial Teeth; George Dieffenbach, City of New York.

Claim—The composition of matter consisting of sulphate of alumina, and other ingredients, substantially as described.

275. Process for Coloring Artificial Teeth; George Dieffenbach, City of New York.

Claim—Developing the color of a cured or hardened composition, by the agency of solar light, when the coloring matter is incorporated into the said composition, while in its plastic or uncured state.

276. Connecting Boards for Roofs, &c.; Wm. T. DeGolyer, Schenectady, New York.

Claim—Covering the joints of board or plank for roofing, by means of sheets of metal bent in the form shown, so that the strips of wood, or other packing used, shall lie on as well as against the flanches turned on said metal.

277. Furnaces; J. H. Duhme, Cincinnati, Ohio.

Claim—The arrangement of the flue spaces controlled by dampers, for the purpose of increasing and perfecting the combustion, as set forth.

278. Cartridges; J. H. Ferguson, Baltimore, Maryland.

Claim—A water-proof and inflammable cartridge, made as described.

279. Harvesting Machines; B. G. Fitzhugh, Frederick, Maryland.

Claim—The combination of a rake and reel revolving on the same shaft, when the rake is so made as to deliver the cut material in a line oblique to the swath of the machine.

280. Grain Cradles; M. R. Flanders, Parishville, New York.

Claim—Attaching the finger standard to the swath by means of the rod and eye, secured respectively to the standard and snath in connexion with the compensating or adjustable braces, arranged as set forth.

281. Gas Purifiers; Peter Fontain, Philadelphia, Pennsylvania.

Claim—The receptacle or receiver, in combination with the filtering and purifying apparatus, arranged as described.

282. Reciprocating Propeller; John Galt, Philadelphia, Pennsylvania.

Claim—Combining the buckets with the frames and with the driving rods, or their equivalents, by means of cross-heads, link connexions, and slots, substantially as specified. Also, the construction of the propellers with the frames of flaring form, and with their buckets fitted to the smaller front portions thereof. Also, constructing the driving rods, each in two parts, one of which connected with the buckets, is capable of being connected with, or disconnected from, the other at pleasure, for the purpose either of closing the buckets before the backward movement, and opening them before the forward movement of the propeller frame commences, or of causing the closing of the buckets before the forward, and the opening of them before the backward movement, as may be desired, and thereby enabling the action of the propeller to be reversed, without reversing the engine.

283. Let-off Motion for Looms; Wm. H. Gray, Dover, New Hampshire.

Claim—The board or plate and springs, applied to the breast beam of the loom, and combined with a clutch by which the yarn-beam can be thrown into gear with the cam shaft or crank shaft of the loom, to operate substantially as described.

284. Rotary Harrows; Christian and J. K. Gingrich, Annville, Pennsylvania.

Claim—The clearers, in combination with roller and ring, when arranged as set forth.

[Clearers are arranged upon the weighted arm of a rotating harrow, so as to precede the traveler or friction roller which supports the weight, and keep the annular ring upon which the traveler rolls clear of dirt in using the harrow, and an adjustable draft bar is added to place the line of draft in any position that may be desirable.]

285. Raking Attachment for Harvesters; C. P. Gronberg, Montgomery, Illinois.

Claim—The peculiar arrangement of the mechanism, namely, the reciprocating rack bar and semicircular toothed bar, in connexion with the bent rack shaft, provided with a spring, arm, and part pinion, and the semicircular bar on the support provided with teeth and a projecting arm for joint operation, as set forth.

286. Alcohometers; Heinrich Guth, City of New York.

Claim—An alcohol indicator, substantially as described, by which the evaporation of a fixed quantity of alcoholic liquid is made to indicate the exact per centage of alcohol contained in the said liquid.

287. Machine for Making Upholstery Springs; James Harrison, Jr., City of New York.

Claim—1st, Giving one or more of the forming rollers a positive rotary motion at a velocity which causes its or their periphery or peripheries to move faster than the periphery of that part of the mandrel in conjunction with it or them at any time in the operation. 2d, Connecting the axle of the roller, or any of the forming rollers, by a link and two universal joints, with a shaft having a longitudinally sliding and also a rotary motion, for the purpose of giving the said roller a rotary motion and a motion along the mandrel, and allowing it to accommodate its position to the varying diameter of the mandrel.

288. Ship's Capstans; J. F. Holloway, Saline Mines, Illinois.

Claim—A capstan having a vertical movement as well as a rotary one, substantially in the manner specified.

289. Stoves; Marcus L. Horton, Lebanon, New Hampshire.

Claim—The ventilator with valve and hood, as arranged, and in combination with chambers and flues, operating as described.

290. Apparatus for Tanning; D. L. Hubbard, Glastenbury, Connecticut.

Claim—The wheel or cylinder having its periphery formed of oblique slats placed within the vat, and arranged to operate as set forth. Further, in combination with the wheel or cylinder, constructed as described, the apron, for the purpose specified.

291. APPARATUS FOR CONDENSING COAL OILS; W. G. W. Jaeger, Baltimore, Maryland.

Claim—The employment of a fan-blower, when the same is used to draw the vapors from the retort, in the manner set forth. Also, in combination with the fan-blower or draft so used, I claim the escape pipe and trap, arranged as set forth.

292. BEDSTEAD FASTENING; J. C. Jeffries, Mount Vernon, Indiana.

Claim—The construction of a bedstead fastening formed with male and female plates, provided with tongues and hooks, when arranged in combination with a post and rail, in the manner as set forth.

293. ARRANGING COUCHES IN RAILROAD CARS; E. C. Knight, Philadelphia, Pennsylvania.

Claim—1st, The mode of arranging berths or couches over backs of railroad car seats, as set forth. 2d, The manner of supporting the backs of the seats by slides and rods, for the purpose described.

294. CROSS-CUT SAWING MACHINE; M. W. Knox, Sheridan, New York.

Claim—1st, The arrangement of the several parts of a sawing machine, as herein described, whereby the operator can manage the sawing, elevating, and depressing the saw, and opening and closing the clamp, without changing his position in relation to the machine. 2d, The guides and blocks, when arranged in combination with the saw, in the manner specified.

295. BRAIDING MACHINES; Isaac W. Lamb, West Novi, Michigan.

Claim—1st, The combination of the two sets of shuttle-carriers, rotating in opposite directions in concentric circles, and the shuttle-changers, having the movements described. 2d, The construction of the shuttles, each with two openings, and with a spring dog entering both openings, to operate in combination with the inclined surfaces and stops of the shuttle-carriers and shuttle-changers. 3d, The combination with the shuttles of the nippers, and their several appendages and appliances, by which their bite or friction upon the plaits are regulated and rendered uniform, substantially as described.

296. PRESERVE CANS; W. D. Ludlow, City of New York.

Claim—The described combination of the key with lugs attached, in the manner shown, to the sides of a cavity in the top of the can, in order to prevent the disruption of the said lugs during the act of closing the can, and avoid projections above or beyond its periphery.

297. MACHINE FOR FOLDING AND PACKING WOOL; Wm. H. Main, Liverpool, Ohio.

Claim—The devices for rolling the fleece into a compact cylindrical form, namely, the combination of the belt, rod, hooks, and pins, the same being operated by means of the windlass and screw, in the manner specified.

298. CULTIVATOR TEETH; Gardner Maynard, Ilion, New York.

Claim—The arrangement of the tooth, stay, and wrought iron stem and brace, when the stem is welded between the wings of the tooth and made to form a brace, as set forth.

299. PACKING FOR STUFFING-BOXES OF PISTONS; Charles M. Burney, Roxbury, Massachusetts.

Claim—A packing for stuffing-boxes composed of canvass and india rubber, as set forth, and cut diagonally, as described.

300. MACHINES FOR PULVERIZING MINERALS; Samuel and George E. Mills, City of New York.

Claim—A series of circular grooved and roughened metallic plates working upon their edges side by side in a trough or cylinder, the circle being larger than the plates, which have an alternating motion in combination with each other and the cylinder, and in connexion with the rock shafts and levers for operating the same.

301. MACHINE FOR FINISHING HAIR-BRUSH HANDLES; Thomas Mitchell, Lansingburg, New York.

Claim—The rotating cutter wheels, and guards, and guides, in combination with the clamps provided with patterns, arranged as set forth. Also, centering the unfinished brushes in the clamp by means of the bristles, in connexion with the strip or plate and the inner edge of the pattern or its extension, as described.

302. DEFECATING SUGAR JUICES; Marie Heloise Nicolas and Louise Josephine Champagne, Thibodeaux, La.

Claim—The employment in the bleaching and defecating of sugar juices, of the herein described combination of sulphur and lime, prepared in the manner set forth.

303. ANIMAL TRAP; Henry S. North and John O. Couch, Middletown, Connecticut.

Claim—1st, The combination of the many-chambered cylinder with the breech-pin, by means of a central counter-bore in the said cylinder, meeting the chambers, and a groove or recess all round the end of the breech-pin, whereby communication is made between the chambers of the cylinder, and all are enabled to be fired at once with a single vent. 2d, Fitting the hammer in the form of a ring to slide along the exterior of the breech-pin. 3d, The combination with the hammer applied to slide along the exterior of the hollow breech-pin, of a rod sliding through the centre of the cylinder and within the breech-pin, and a spring sear attached to the said rod, and working through a slot in the breech-pin, as described. 4th, The combination with the hammer applied outside of the hollow breech-pin of a collar, or its equivalent, applied within the breech-pin, and having pins or ears projecting through slots in the sides of the breech-pin behind the hammer, and a helical spring applied within the breech-pin, behind the said collar, or equivalent. 5th, The extension of the central rod which carries the sear directly through the cylinder and through the hollow breech-pin, so that it may be operated either by a pull at its front end or by a push at its rear end. 6th, In combination with the many-chambered cylinder, hollow breech-pin, hammer, central rod, sear, and spring, and collar, as described, we claim the stock and trigger, applied as described, to make a weapon that can be baited and set for shooting game, by the seizure of the bait, or that can be used in the hand like an ordinary pistol or fire arm.

304. TOOL-HOLDERS FOR LATHES; Charles Peck, New Haven, Connecticut.

Claim—1st, The combination of the tool-rest with the segment, or their mechanical equivalents, so as to elevate or depress the cutting instrument, when arranged in the manner described. 2d, The T-slotted bed-plate with the tool-rest connecting the tool-posts, when combined in the manner described, so as to allow the cutting tool to be placed at any required angle horizontally.

305. CLOTHES DRYER; George Race, Norwich, New York.

Claim—1st, The employment of a hollow post enclosing the arms of the reel, in which the arms may be elevated and depressed through its top, in the manner set forth. 2d, The combination of the sliding head and the arms hinged to said head at their lower extremities, and connected by cords, or other equivalent connexion, at their upper extremities, as described. 3d, The combination with the foregoing of the cord and

pulleys, the pinion, rack, and latch, for elevating and securing the head in the hollow post, when constructed in the manner set forth.

306. Machine for Driving Hoops on Pails, &c.; Wm. Raymond, Marlboro', New Hampshire.

Claim—The employment of a driver, when either fixed or turning loosely in its bearings, and operated by means of a jointed lever, or otherwise, so as to press against and drive the hoop upon the tub, when a rotary motion is given to said tub.

307. Cooking Ranges; Wm. Resor, Cincinnati, Ohio.

Claim—The peculiar construction of the plate which constitutes the upper plate of the stove, forming, as it does, the plate of the stove, the arched roof of the damper chamber, and part of the chimney pipe, in the manner set forth.

308. Mode of Lifting Stamps for Crushing Ores; Delos E. Rice, Detroit, Michigan.

Claim—The application of the folding wedges, in combination with the band, or their equivalents, thereby producing a uniform lift of the rods together with the stamp heads.

309. Machine for Turning Hubs; Alex. Rickert, Schoharie, New York.

Claim—1st, The graduated scale, in combination with the index, and the sliding frame, and hub blank, and mandrel, operating in connexion with the cutters, in the manner described. 2d, The constructing the sliding sleeve with an opening at the angle so as to slide over and upon the large cutter on the shaft, so as to cut any required size of hub without change of knife, as described. Also, the constructing the sliding sleeve (or cutter and stock,) to pass over and mask the fixed knife on the shaft, in connexion and combination with the making one of the sides of the sleeve thicker and heavier than the other, in order to approximate to an equipoise of the shaft. 3d, The setting and adjusting (by means of the slot and screw-bolt) the arm, so as to cut any required length of hub, and so arranged upon the bar as to allow it to vibrate, for the purpose of bringing up the cutters to the hub or throwing them back when required, and without interfering with the screw or the adjustment of the arm.

310. Cotton Cultivators; Wm. J. Rivers, Sumter District, South Carolina.

Claim—The handles, helve, beam, foot bar, plough, harrow, roller frame, and roller, when arranged for joint operation as described.

311. Apparatus for Heating, Cooking, and Ventilating; C. B. Sawyer, Fitchburgh, Massachusetts.

Claim—The combination of the oven and range with the fire-pot, fire-flues, and air-pipes, as described.

312. Broom Clasp; P. B. Sheldon, Prattsburgh, Assignor to self and J. T. Upson, Huron, New York.

Claim—The feathers or ribs, in combination with the screw-threads of the shanks and with the handle, as described. Also, the combination of the conical screw shanks, conical screw ferrule, and screw-bolts, and nuts, arranged as set forth. Also, the wires attached to the jaws and arranged in combination therewith, in the manner described.

313. Corn Shellers; Adon Siddall, Ramson, Michigan.

Claim—The arrangement of the stirrup with the levers for operating the adjustable sliding pressure bar, in the manner described.

314. Power-pulley Presses; William and Robert Skene, Louisville, Kentucky.

Claim—1st, The arrangement of the scroll and the conical windlasses, E E′, to operate in combination with the windlass, H, and with the two followers, or their equivalents, as specified. 2d, Arranging the scroll and the windlasses, E E′, or their equivalents, on slides, which are rigidly attached to the upper follower, so that the weight of those parts assists in increasing the pressure on the substance placed between the two followers. 3d, The arrangement of the two followers with pulleys to operate, in combination with the scroll, the cone windlasses, and the ropes, substantially as set forth.

315. Power Gear Presses; William and Robert Skene, Louisville, Kentucky.

Claim—The arrangement of the windlasses, the weight, the scroll, and the pinion, H, to operate in combination with the cog-wheel, the pinions, E and E′, the double rack, and the follower, substantially as specified.

316. Carpet Fastener; M. D. and S. A. Snyder, Clarendon, New York.

Claim—An improved carpet hook, consisting of the barbed shank, gauge notch, throat, and rectangular clinching hook, constructed in the manner described.

317. Retorts for Distillation of Coal; John L. Stewart, East Boston, Massachusetts.

Claim—My improved revolving web retort, constructed not only with its induction and eduction openings arranged at or near one end of it, but with an endless, or other proper carrier, made so as to operate to receive the coal or matter to be distilled from or near one end of the retort, and carry or force the same toward the opposite end thereof, and from thence backward toward the front end, and there discharge such, the same causing the coal or matter to be distilled to pass twice through the retort or carbonizing chamber, in manner and for securing advantages specified. And, furthermore, in combination with the retort or its discharging mouth, a water-sealing trough and an endless carrier to operate in such trough, substantially as specified, to receive or carry away from the retort the discharged coke or products, the water of the trough, under such application of it to the discharging mouth, serving to furnish vapor or steam to the retort in manner, and to effect an advantage in the distillation of the coal or matter therein, as specified.

318. Machines for Making Hay; J. C. Stoddard, Worcester, Massachusetts.

Claim—Arranging the rakes in radial slots between the two drum-heads, and fixing them therein, so as to serve the purpose of a hay-making, and by a single change, a hay-raking machine, in the manner set forth.

319. Apparatus for Drying Grain; Joseph Souter, Chicago, Illinois.

Claim—The drying of grain by means of heated air within a vertical cylindrical chamber, which is provided with a series of tapering rims and a central shaft, which is armed with a series of winged scattering wheels, when a fan, or some other equivalent means, is employed for producing an upward current of heated air through the said chamber, in the manner set forth.

320. Apparatus for Heating Buildings; George S. G. Spence, Boston, Massachusetts.

Claim—The arrangement of the elevated sides of the boiler, in combination with the pipe, or its equivalent, depressed within the same for heating and distributing the air, in the manner set forth.

321. HARVESTING MACHINES; A. G. Stipher, Richmond, Indiana.

Claim—1st, The employment or use of the tilting spring rake, in combination with the sliding raker frame, arranged as set forth. 2d, Operating the raker frame and raker, by means of the reciprocating bar, through the medium of the rack, cog-wheel, pulley, and cord, arranged as set forth. 3d The combination with the raker, the sliding trap-doors, operated by means of the bent levers, springs, and cams, as set forth.

322. DEFECATING SUGAR JUICES; A. A. Tait, Assignor to George B. Hartson, City of New York.

Claim—The employment of the sulphate of tin, applied in manner substantially as described, for defecating cane juice and syrups.

323. FRAMES FOR MANUFACTURE OF SOAP; R. P. Thomas, Syracuse, New York.

Claim—Lining soap frames in ordinary use with flexible metallic plates, in the manner set forth.

324. CORN PLANTERS; C. G. Udell, Morris, Illinois.

Claim—1st, The arrangement of the grain box, tubes, connecting bars, and legs, constructed in the manner set forth. 2d, In combination with the above, I claim the measure, marking rod, and guide, constructed in the manner set forth.

325. MACHINE FOR HULLING AND SCOURING GRAIN; T. F. Wagoner, Trenton, New Jersey.

Claim—The combination of two surfaces, one of which is elastic and the other hard, when the planes of said surfaces are placed on a plane with the horizon, and one of them having a circular motion for the purpose of hulling and scouring grain, as set forth.

326. HORSE-SHOE MACHINE; H. L. Watts, Chester, Massachusetts.

Claim—The arrangement and combination of the slotted carriage, the die, the followers, the rollers, as described.

327. ROTARY CULTIVATORS; John Young, Joliet, Illinois.

Claim—The arrangement and combination of the skeleton or open rotary ploughing cylinder, when the mould-boards thereof are set tangential, and extend from end to end of the cylinder in a straight or oblique direction, in combination with a rotary shaft or circular edge discs, the whole being operated as set forth.

328. HARVESTING MACHINES; McClintock Young, Jr., Frederick, Maryland.

Claim—Combining the handle of the rake with the shaft by means of the supporter, the shaft arm, the crank, the pitman, h, and the pitman, i, and in such a manner that the rotation of said shaft will steadily and positively impart the desired movements to the rake. Also, the combination of the cams and the guides, or either of them, with the above described mechanism for operating the rake, constructed in the manner described.

329. FURNACES; E. B. Cherevy, Assignor to self and T. W. Weathered, City of New York.

Claim—The hollow dome, k, over the fire, in combination with the dome, h, in the manner and for the purposes specified, whereby the heat ascends into said dome, k, and then passes away between the domes, h and k, heating the circulating water, as specified. Also, the thimbles passing through the flanches and forming openings for the circulating water, as specified.

330. MODE OF IMPARTING MOMENTUM MOTION TO A SIFTING APPARATUS; Samuel Clark, Assignor to W. O. Bourne, City of New York.

Claim—1st, The imparting a short, quick, or jarring motion to a sifting apparatus, or machinery of any kind, where such motion is desirable, by means of an oscillating, vibrating, or reciprocating weight, brought, at the end of its motion, into contact with the said apparatus or its attachments, in the manner described, or its equivalent. 2d, Suspending the object to which the motion is applied by means of a suspending or supporting link or rod, with concave bearing parts uppermost at both ends and convex bearing parts undermost, constructed as above set forth, or in an equivalent manner.

331. SEEDING MACHINES; Daniel Foreman, Assignor to self, G. W. Sweringen, and Jonathan Penoyer, Navarre, Ohio.

Claim—The arrangement and combination with the interior of the peculiarly formed hollow slide of the adjustable plate, as described.

332. LET-OFF MOTION FOR LOOMS; W. H. Gray, Dover, New Hampshire, Assignor to self and Luther Robinson, Melrose, Massachusetts.

Claim—1st, Combining the clutch, or its equivalent, by which motion is imparted to the let-off mechanism, with the yarn-beam, by means of a worm-gear on the yarn-beam, and an endless screw and spring, applied, substantially as described, to the shaft which controls the rotation of the beam, and operating as set forth. 2d, In combination with the worm-gear, endless screw, and spring, applied as described, I claim the lever applied between the said spring and the surface of the yarn on the beam, and operating as specified.

333. PORTABLE DOOR FASTENER; Levi C. Johnson, Assignor to self and J. B. Smith, Buffalo, New York.

Claim—The sliding bar (including the plate, F), when so constructed as to form the slot, and so connected and arranged with the plates, A and A′, and bolt, B, as that when placed in the door for use, the bar will stand at right-angles with the bolt, and when folded for carrying in the pocket, the plate, F, will cover the teeth or spurs of plate, A, as described.

334. METHOD OF PROTECTING IRON FROM OXIDATION; E. G. Pomroy, City of New York, Assignor to J. R. Pomroy, Brooklyn, New York.

Claim—The preparation of iron by corroding or oxidizing its surface, for the express purpose of making the same rough and capable of being closely and firmly united with a covering of fire-proof paint, by means of rolling, or other mechanical force, and the application of the other processes above described to iron so prepared, in combination therewith.

335. GRAIN SEPARATORS; Austin Potter, Assignor to self and J. W. Norton, Williamson, New York.

Claim—The application of the adjustable slide-board to the endless riddle, in such a manner that the grain and straw can be made to impinge upon the end or more open meshes of the same, or upon the top, thereby varying and adapting the action to the quality of grain and straw, and employing the force with which it leaves the cylinder as a means of separating the two. Also, the combination and arrangement of the parts, consisting of the fan, self-vibrating riddle, with pulleys driven directly from the cylinder, elongated shaker and board, and intermediate adjustable slide-board, operating conjointly to form a more portable, cheap, and effective separating attachment to threshing machines.

336. Apparatus for Oiling Cylinders and the Pistons of Steam Engines; C. A. Stebbens, Assignor to self and R. J. Todd, Boston, Massachusetts.

Claim—The combination of the lifter and tubular holder, or their equivalent or equivalents, with the valve and the piston, the whole being constructed and applied together, and to a reservoir and its pump barrel, in the manner specified.

Extension.

1. Machines for Raising and Lowering Weights; Ephraim Morris, City of New York; patented July 5, 1845; extended June 28, 1859.

Claim—The manner of combining the barrel discs with the wheel, for the purpose of hoisting, lowering, or suspending weights by means of the ribs and grooves, or any analogous device. And the further combination therewith of the means employed to govern and regulate the action of said parts, namely, the friction bands and levers, the attaching or detaching lever, rolling shaft and bit, pin and slide-key, substantially as such manner and combination are shown, irrespective of the power employed to work the machinery, and also irrespective of the mode by which power is connected to the working parts.

Additional Improvement.

1. The Construction of Chairs, Sofas, &c.; Charles Robinson, Cambridgeport, Massachusetts; patented March 9, 1858; additional dated June 14, 1859.

Claim—Additional to the original improvement, the spring plate, arranged and operating in combination with the supporting blocks, as specified.

2. Railroad Car Springs; A. B. Davis, Philadelphia, Pennsylvania; patented February 15, 1859; additional dated June 28, 1859.

Claim—The bore and cover plate secured together by a bolt, or other suitable fastening, in combination with one or more loose plates placed within the box, so as to divide the latter into two or more compartments.

Re-Issues.

1. Cotton Gins: David G. Olmstead, Vicksburg, Mississippi, Assignee of R. A. L. McCurdy, Sabine Parish, Louisiana; patented June 26, 1855; re-issued July 15, 1856; re-re-issued June 14, 1859.

Claim—The revolving screen, cylinder, or shaft situated in the hopper or roll-box, so that the roll moves around it, when arranged in the manner described, whether as a single or double device, so as to perform any or all of the functions. Also, discharging the hulls and trash from the roll-box through the sides of the cotton gin.

2. Fastening Centre-bits; Able W. Streeler, Shellburne Falls, Massachusetts; patented Jan. 23, 1855; re-issued June 14, 1859.

Claim—Fastening a bit in its stock by means of a projection on one, and a suitable recess for it on the other, when combined with mechanical pressure or friction that will hold the projection and recess together.

3. Water-backs for Ranges; James Ingram, City of New York; patented February 16, 1858; re-issued June 21, 1859.

Claim—Protecting the water-backs of ranges by the introduction of a movable fire-brick, soap-stone, or equivalent material, between the fire and said water-backs. Also, arranging said water-back, as set forth, whereby the same can be moved away from the fire to allow space for introducing said protecting fire-brick, or its equivalent. And in combination with said water-brick, the lever and weight, or their equivalent, to move the intervening soap-stone or fire-brick.

4. Bridges; D. C. McCallum, Owego, New York; patented Jan. 20, 1857; re-issued June 21, 1859.

Claim—So combining the arch cord or beam, the arch brace, and the abutment or pier of a bridge, as that the thrust of the arch shall be thrown down upon the abutment or pier, and any deflexion in the lower cord be counteracted by an upward force at the upper ends of the arch braces. Also, the method of lengthening or shortening the braces of a bridge truss or girder, by which the truss may be elevated or depressed, as required, by means of the yoke, the plate on the end of the brace, and the straining pieces with their nuts, as described.

5. Governors for Steam Engines; Charles T. Porter, City of New York; patented July 18, 1858; re-issued June 21, 1859.

Claim—1st, In combination with arms and very small balls, or their equivalents, revolving at a velocity several times greater than would be due or natural to them, considered as a conical pendulum, the employment of a counterpoise, applied as described, and so proportioned in weight as to balance, or nearly so, the centrifugal force developed by the revolution of the said arms and balls, or their equivalents. 2d, The employment, at the connexion between the arms and the central spindle of the governor, of a joint, constructed as described, whereby each arm is brought to the outside of the joint on one side, and made to thrust against the joint pin close to one end thereof at a right-angle, and at a distance from the axis of revolution.

6. Veneers; John A. Jackson, Assignee of Israel Amies, Philadelphia, Pennsylvania; patented December 11, 1855; re-issued June 21, 1859.

Claim—The embossed veneers described, the same being adapted for subsequent application in the construction and ornamenting of furniture, and other articles, to which veneers are or may be applicable.

7. Reaping Machines; Obed Hussey, Baltimore, Maryland; patented Aug. 7, 1847; re-issued April 14, 1857; re-re-issued June 21, 1859.

Claim—The combination of side and cross bearings of the guards, with flush edges at or near the forks of the blades.

8. Reaping Machines; Obed Hussey, Baltimore, Maryland; patented Aug. 7, 1847; re-issued April 14, 1857; re-re-issued June 21, 1859.

Claim—Scalloped cutters with their blades beveled, as described.

9. Process of Grinding Paper Pulp; Joseph Kingsland, Jr., Franklin, New Jersey; patented Dec. 23, 1856; re-issued June 28, 1859.

Claim—The process of reducing fibrous substances to pulp suitable for making paper, whilst such fibrous

substances are suspended in water, by subjecting them to the operation of grinding or beating action in a closed vessel, to which it is supplied by the hydraulic power of a descending column of water so charged with the fibrous substance, and permitting it to escape and be discharged so soon as it is sufficiently reduced. Also, separating the fibres from the mass so soon as they are sufficiently reduced, and discharging them by the hydrostatic pressure of the column of water in which the fibres are suspended, and which in flowing upward to the discharge carries with it only the fibres which are sufficiently reduced.

10. Machinery for Grinding Paper Pulp; Joseph Kingsland Jr., Franklin, New Jersey; patented Dec. 16, 1856; re-issued June 28, 1859.

Claim—The combination of the rotating grinder with, and inclosed in, a surrounding case, which constitutes the opposing grinding surface, and which is provided with a feeding pipe and discharge aperture, suitable for feeding or carrying the fibrous substances to and from the grinder in the inclosed vessel, by the hydraulic pressure of a descending column of water.

11. Brick Machines; Joseph W. Jayne, Sandusky, Ohio; patented May 5, 1857; re-issued June 28, 1859.

Claim—1st, The yoke, constructed in the form described, by which converging planes are held firmly in the same position relative to each other, whether the same be composed of one or more pieces of metal. 2d, The radial sliding and revolving chargers, in combination with the mould-wheel. 3d, The arrangement of the guide stem on one side of the pressers instead of on the end, whereby I am enabled to place the pressing roller in the cavity of the piston. 4th, Making the piston or presser hollow, and inserting the pressing roller in the cavity thereof (instead of placing it upon a guide stem as heretofore done).

12. Process of Manufacturing Wire Grating, &c.; Henry Jenkins, Brooklyn, New York; patented March 6, 1847; re-issued June 28, 1859.

Claim—Manufacturing screws, or other articles, from metallic wires or bars that are bent or crinkled at the point of intersection previously to being laid or woven up, whereby I am enabled to form meshes of any desired size or shape by such intersecting bars or wires, so that they shall be rigid and durable, as set forth, and this I claim irrespective of the mechanism for bending or crinkling said wires, or interweaving them to form the requisite meshes.

13. Washing Machines; Miner Van Auken, Saratoga Springs, New York; patented May 11, 1858; re-issued June 28, 1859.

Claim—1st, Providing a stop-board at the lower portion of the rear end of the rubber, as set forth. 2d, Providing an oblong slot, the lower termination of which is of scroll form, in each of the pendulous arms of the rubber, as set forth. 3d, The combination with said slot of a back trip-board, as set forth.

14. Machine for Finishing Brush Handles; John Ames, Assignee of Thomas Mitchell, Lansingburgh, New York; patented June 23, 1857; re-issued June 28, 1859.

Claim—1st, The combination of the crown-wheel saw with the adjustable platform and stop, as set forth. 2d, The wheel, provided with the oblique cutters, in combination with the guard or gauge piece, the cutter wheel and gauge piece being arranged relatively with each other, substantially as set forth. 3d, The arrangement and combination of the platform with revolving cutters shaped and operating as described, crown-saw, with the arms and the adjustable platform and cutter wheels, with their cutters, as described.

15. Valves for Dry Gas Metres; W. Hopper and R. H. Gratz, Assignees of C. C. Lloyd, Philadelphia, Pa.; patented June 22, 1858; re-issued June 28, 1859.

Claim—1st, The combination of the rotary valve with a series of brakes or edges, arranged so as to escape the upper surface of the valve seat. 2d, The drip and valve seat, arranged so as to collect and carry off any liquid deposit in the metre. 3d, The valve carriage, arranged substantially as described. 4th, The combination of the valve, the valve seat, the shafts attached to the diaphragms, arranged for the purpose of restraining a reverse movement in the metre, and thus dispensing with the click and ratchet.

16. Ice Cream Freezers; H. B. Masser, Sunbury, Pennsylvania; patented Dec. 12, 1848; re-issued January 1, 1850; re-re-issued June 28, 1859.

Claim—A scraper or scrapers which act or bind during the process of freezing cream with a yielding spring force against the inner surface or surfaces of the cream chamber, as set forth.

Designs.

1. Sewing Machines; Solomon B. Ellithorp, City of New York; dated June 7, 1859.
2. Cook Stove; Anthony J. Gallagher and Jacob Beesley, Assignors to Anthony J. Gallagher, Philadelphia, Pennsylvania; dated June 7, 1859.
3. Stove Plates; S. W. Gibbs, Albany, New York, Assignor to Abbott & Lawrence, Philadelphia, Pennsylvania; dated June 14, 1859.
4. Stove Plates; S. W. Gibbs, Albany, New York, Assignor to Abbott & Lawrence, Philadelphia, Pennsylvania; dated June 14, 1859.
5. Top and Bases of Sheet Iron Stoves; S. W. Gibbs, Assignor to Rathbone & Co., Albany, New York; dated June 14, 1859.
6. Arms of Sewing Machines; James S. McCurdy, Brooklyn, New York, Assignor to John M. Myers, City of New York; dated June 14, 1859.
7. Match-boxes; P. J. Clark, Assignor to S. S. Clark, West Meriden, Connecticut; dated June 28, 1859.

JULY 5.

1. Furniture Caster; Demas S. Barnes, City of New York.

Claim—The spherical roller with its axle running in the frame work, in combination with the two convex surfaces, or with the convex and concave surfaces, so as to enable the same readily to revolve on a vertical axis, the whole being constructed and enclosed in the tube or case, as described.

2. Water-wheel; Benjamin Billings, Macedon, New York.

Claim—The conical crown and conical wheel, constructed in the manner specified.

3. Cotton Harvesters; Lewis Bishop, Talladega, Alabama.

Claim—The endless picker chains placed on the cylinder in connexion with the brush cylinder, the above parts being attached to a cart or to a box or receptacle mounted on wheels, as set forth.

4. Hook for Whiffle-trees; Snowball Botterill, Westmoreland, New York.

Claim—The combination and arrangement of hooks and spring button, in the manner set forth.

5. Wind Engine; Henry W. Bowen, Providence, Rhode Island.

Claim—The frame provided with sails and attached to the shaft, in connexion with the bent lever connected with the sails by the rods and arms, the links, spring rod, and the weight and spring, or their equivalents, arranged as set forth.

6. Washing Machine; Robert Brown, Stroudsburg, Pennsylvania.

Claim—The arrangement in the trough of the chambers and transverse strips with the bars, when the chambers stand behind the strips, and the strips are placed in such a relation to the bars that they will pass between them, and thus at the same time press and rub the clothes.

7. Harvesting Machines; Thomas B. Butler, Norwalk, Connecticut.

Claim—The employment of the cams and guides, for the purpose of giving a forward and backward motion to the cutter bar and cutters.

8. Method of Reducing Wood, &c., to Sawdust or Finer Grains; W. J. Cantelo, Burlington, New Jersey.

Claim—Reducing glutinous, fibrous, and other tough materials, to powder, by placing the ends of blocks of the same opposite to and in contact with each other, and presenting them simultaneously, and at the point of junction, to the edge of a circular or reciprocating saw, with the aid of the appliances described.

9. Machinery for Webbing Single Strands of Thread; Michel Celerier, Philadelphia, Pennsylvania.

Claim—The combination of the pulley, the sliding car, the fork, and the eye-piece, arranged as described, for preparing silk for making twist.

10. Wrought Nail Machine; Charles Clareni, City of New York.

Claim—The combination of the top and side hammers and vibratory anvil, so as to form two or more nails at a time without turning the rod. Also, the apparatus for connecting the driving shaft with the top hammer, by which it receives its motion in a proper manner. Also, the connexion of the side hammers with the driving shaft to produce the requisite motions thereof, and allow said hammers to be raised and lowered. Also, the arrangement and operation of the cutter, as described, for severing the nail from the rod.

11. Ploughs; Isaac Cook and John T. Bever, Haynesville, Missouri.

Claim—The combination and arrangement of the sharp-edged land side wheel with a reversible, double-pointed mould-board, which has no land side bars, as set forth.

12. Steam Engines; George H. Corliss, Providence, Rhode Island.

Claim—Imparting to the liberated slide valves of steam engines their closing movements by springs, so connected with the valve gear that whilst these springs impart the same initial force to the valves at every operation, the expansive force which these springs exert varies with every change in the range of movement given to the valves. Also, imparting to the liberated slide valves of steam engines their closing movements, by springs combined with a curved moving support, in such manner that the spring applies itself tangentially to the said support, and the effective length of the spring varies with the tensive force which it exerts.

13. Method of Opening and Closing Farm Gates; B. M. Dorr, Kenawee, Illinois.

Claim—The arrangement of the pinion, the toothed racks, and the levers, to operate in combination with the slotted rods, and the crank levers, for the purpose of opening and closing the gate.

14. Water-proof Paints; Epes E. and Joseph F. Ellery, City of New York.

Claim—The composition prepared and composed of the materials, as described, in the proportions set forth, for the purpose of making water-proof paint.

15. Mills for Crushing Cane; H. C. Emery, Lincoln, Ohio.

Claim—The adjustable shafts of the rollers in slide bearings, at top and bottom, operating them in a rectilinear frame in a direct manner for giving a wedge pressure, providing them near their top with flanches and a groove and a bevel on their bottoms, from the periphery toward the shafts, the several parts standing in the relation to each other, as specified.

16. Lamps; A. L. Fleury, Baltimore, Maryland.

Claim—1st, The quick-lime cones, or their equivalents, arranged as described. 2d, In combination with the above, the flanched cap, as described.

17. Machine for Finishing the Exterior of Rims of Carriage Wheels; Reuben Fretz, Montville, Ohio.

Claim—Combining in the arm that gauges the plane, devices for varying the height of the radial arm with the devices for varying its length, so as to enable the operator to dress a wheel straight or square across the edge. Also, making the arm or bar which guides the plane in the arc of a circle, to vibrate in the stock, so as to adjust and fasten it in the position desired.

18. Cut-off Gear for Steam Engines; P. W. Gates, D. R. Frazer, and T. Chalmers, Chicago, Illinois.

Claim—The combination of the two levers, D D′, and their dogs, the lever or levers, C, and its or their teeth, and the eccentric curved plate or plates, the whole applied to the stem or stems of the valve or valves, to operate as set forth. Also, in combination with the said levers, teeth, and dogs, and the eccentric curved plate or plates of the arm on the valve stem, and the spring or stationary curved surface, applied and operating as specified.

19. Machine for Cutting Ends of Billiard Cues True; Ira Glynn and Mikel Borowsky, Placerville, Cal.

Claim—The application of the reversed knife or cutter, and the spring jaws for holding the cue, so as it can be cut off square for the leather—these jaws will open or close to suit the size of the cues.

20. Printing Press; George P. Gordon, City of New York.

Claim—1st, Taking the sheet from the feed-board by grippers, or their equivalents, and presenting it directly to or upon the form of types, thence conveying it to the place of impression so that it may be printed. 2d, The combination of a reciprocating bed with a set of sheet-receiving grippers, so that the movements of the bed may control the action of the grippers, in order that the sheet may be taken from the place of feeding

to the place of printing by such grippers. 3d, The combination of a vibrating platen, having a stationary or fixed axis upon which to vibrate, with a reciprocating bed. 4th, The combination of a set of sheet-piling grippers which will peel or take the printed sheet from the face of the type and pile it on its place of deposit, with a reciprocating bed. 5th, By use of automatic grippers, piling the sheets directly before or in front of, and under the eye of the operator, so that he may at once detect any imperfection in the impression. 6th, The combination in one and the same machine of a set of grippers, to take the sheet and carry it to the place of printing, with another set of grippers to take the sheet from the form and pile it. 7th, The arrangement and construction of a chase, as described, in combination with the piling grippers. 8th, The giving a reciprocating vibratory motion to a bed or carriage, allowing the necessary intervals of time for the purpose of receiving the sheet or the impression, either or both of them, by means of the cam forming part of the bed, the cranked shaft, the vibrating arm, and the connecting rod, or their equivalents.

21. PADDLE-WHEEL; William Gorman, City of New York.

Claim—The sliding paddles or floats placed between the traverse bars of the arms of the wheel, and arranged with the catches and stationary cam, or their equivalents, to operate as set forth.

22. CORN HUSKERS; S. N. Gragg, Shelburne Falls, Massachusetts.

Claim—The curved or convex rest, in combination with the reciprocating knife, arranged as described.

23. SEWING MACHINES; William Grout, Worcester, Massachusetts.

Claim—1st, The arrangement of the feeding bar, needle, and looper, in the manner described, so that the movement of the cloth shall aid in extending the looper thread and in tightening the needle thread, and this when the needle is out of the cloth. 2d, The arrangement of the looper and forceps, so that the forceps shall draw the loop of the needle thread across the path of the looper, and in line with the movement of the cloth. 3d, The combination of the needle and looper, when arranged so that both shall reciprocate in straight lines, and also so that by merely changing the length of the looper a single or double stitch may be formed, in the manner described.

24. ABDOMINAL SUPPORTERS; Benjamin A. Grover, Momence, Illinois.

Claim—1st, Constructing an adjustable spring steel frame, of the form described, by combining, arranging, and securing together a series of spring bars, in the manner described. 2d, Covering the concave portion of said frame with a canvass, or other cloth, whose edge or border is gathered and drawn together over the outside edges of the said spring frame, by an india rubber or other elastic cord, so as to give the covering portion of said canvass, or other cloth, the character of an elastic cushion, no matter what may be the extent of the contraction or expansion of the spring frame. 3d, Attaching the upper and lower straps which respectively branch upward and downward from the band of the main strap at the points of the spring frame, and in the relation to each other and the centre or main straps, so as to give an upward pressure to the spring frame, and for other purposes set forth.

25. HORSE RAKES; Elijah Harris, Princeton, Illinois.

Claim—The levers with the arms and the projection or finger, in combination with the stop, as set forth.

26. DOOR FASTENING; W. Hartsfield, Thomaston, Georgia.

Claim—The arrangement of the bar which is attached to the inside of a door, to operate in combination with the staple, and with the bolt and spring, as described.

27. MACHINE FOR BORING; Henry Hays, City of New York.

Claim—The arrangement of the adjustable head blocks, carrying the spindles of the boring tools, when combined with the spring-tightening pulley, in the manner specified.

28. STOVES; John Henderson, Horseheads, New York.

Claim—The construction and arrangement of the ventilating passages and concealed flues, the former having their origin in the heating chamber, and terminating at or near the top of the oven, and the latter starting from the lower part thereof, and terminating in the flue, whereby external air is admitted, and currents thereof passed through the oven.

29. CONSTRUCTION OF SHEET METAL COFFINS; Isaac C. Shuler, Amsterdam, New York.

Claim—1st, The arrangement of stiffening the lower part of a sheet metal coffin by locking together the scrolled edges of the sides and bottom, forming a firm rim when they are soldered together. 2d, The sheet metal rim, c, on the outside of the walls, as a means of stiffening the base either with or without a filling of molten metal, according to the size of the coffin. 3d, The rim, d, of sheet metal, single or scrolled, forming an inside chamber, which may be filled with molten metal or left hollow, according to the size of the coffin. 4th, A cast metal rim, f, with a deep groove on the under side, which receives, straightens, and stiffens the walls, and which serves to support the lids. 5th, Setting the pillows or braces, x, at the corners and around the body of the coffin between the inward projections of the rims, d and f, which give them an extended purchase, for the purpose of stiffening the walls; also, the peculiar braces, K, to prevent the lateral racking of the bottom. 6th, The arrangement of pressing inverted beads or recesses, in any required number, in the sheet metal of the lid, walls, and bottom of a metal coffin on the inside and on the outside of the same, which may be filled with molten metal in the large size, and left empty in the small size coffins, for the purpose of securing, by a peculiar mode of manufacture, of a level surface between the indented parts described. 7th, The arrangement of fastening firmly on the under side, near the outer edge of the air-tight lid of a sheet metal coffin, a cast metal rim, or its equivalent, for the purpose of strengthening this lid, and also for fitting into the groove in the rim, F, on the upper edge of the walls of the coffin. 8th, The arrangement of fastening around the face-window on the under side of the air-tight lid of a sheet metal coffin, a cast metal sash or rim, m, which receives and supports the face-glass when it is cemented in its proper place. 9th, The arrangement of fastening permanently, on the under side near the outer edge of the sheet metal blind, m, which covers the glass in the face-window of a sheet metal coffin, a cast metal brim, o, or its equivalent, for the purpose of strengthening and furnishing a means of securing the same to the outer lid which covers the air-tight joint. 10th, The arrangement described of two entire, distinct, separate sheet metal lids.

30. BUTTER COOLER; G. W. Smith, Hartford, Connecticut.

Claim—The arrangement of the air-tight ice chamber, in combination with the butter-plate and with the cup, as set forth.

31. DEVICE FOR HEATING STEAM BOILERS; Daniel Hess, Uniontown, Iowa.

Claim—1st, The combination with a steam boiler of the tight external casing and fan, for the purpose of producing currents of air around the boiler. 2d, In combination with the subject of the first claim, the stove provided with a smoke-pipe through which the products of combustion pass, while the heat passes into the casing.

32. AUTOMATIC FAN; Hervey Hoffman, City of New York.

Claim—The arrangement of the rock shaft, arms, bells, and rollers, or the equivalents, to operate in combination with the fan-carrier.

33. RAILROAD CHAIRS; Isaac B. Howe, Northfield, Vermont.

Claim—The one-lip chair, secured by the single bolt, in combination with the permanent fishing piece, arranged and operating in the manner set forth.

34. MANUFACTURING WADDING; Julius C. Hurd and Moses A. Johnson, Dorchester, Massachusetts.

Claim—The described wadding, having its two surfaces felted, as set forth.

35. MOWING MACHINES; Obed Hussey, Baltimore, Maryland.

Claim—In combination with the ordinary apparatus fixed to the extreme end of the finger beam, and called a track clearer, a similar apparatus at the opposite or frame end of said beam, when so arranged as to sweep the cut grass towards the centre of the swath, and leave it in a windrow behind the machine.

36. MACHINE FOR TURNING OVALS; Joshua Irving, City of New York.

Claim—The sliding disc and driving rim combined with the centre mandrel and slides.

37. HORSE-SHOE; Joseph Jorey, Rocky Hill, Connecticut.

Claim—The combination of the plate, corks, and shoe, in the manner described.

38. CULTIVATORS; Philip Kribs, Jefferson Furnace, Pennsylvania.

Claim—The arrangement of the bars, A B C, metal frame, handles, shanks, teeth, bar, I, and shafts, as described.

39. HORSE RAKES; Philip Lebzetter, Lancaster, Pennsylvania.

Claim—The double axle, brace, and sliding bands, hinged braces, slot-hook and staple, binding screw, hinged rod, and beam, combined in the manner specified.

40. VAULT DOORS AND CAST IRON SAFES; Lewis Lillie, Troy, New York.

Claim—The arrangement and combination of a series of pipes or tubes, and the filling of the same with cast steel hardened, or with refined cast iron, as described.

41. DOOR-KNOB BOLT; Lewis Lillie, Troy, New York.

Claim—The knob-bolt or spindle, constructed in the manner described. Further, the switch and the nut, arranged and fastened to and upon the knob-bolt or spindle, in the manner as set forth.

42. TRUNKS; Matthias Ludlum, Fair Haven, Vermont.

Claim—The combination with a water-tight shell or body part to a trunk or box, having ordinary or any other suitable inner and outer lids of a valvular spring borne lid of water-tight construction, and arranged to occupy an immediate position in relation to the inner and outer or ordinary lids, essentially as set forth.

43. BUCKLES; Thomas P. Marshall, Trenton, New Jersey.

Claim—A buckle, constructed of a sliding case with the platform and slot, in combination with the nose, and otherwise arranged as set forth.

44. ROTARY PUMPS; Jarrett Megaw, Wilmington, Delaware.

Claim—Combining the water-packing chambers formed around the axes or shaft, between the suction pipe and stuffing-boxes, with the descending main or discharge pipe of the pumps.

45. RAILROAD CAR COUPLINGS; Richard L. Mills and Paul Carpenter, Lancaster, Ohio.

Claim—The arrangement of the sliding frame and vibrating frame, in combination with the flat locking key, constructed as set forth.

46. MACHINES FOR PLANTING COTTON SEED; Z. N. Morrel, Cameron, Texas.

Claim—1st, The combination and arrangement of the one side-wheel, cylinder, stirrer, gear wheels, mortised beam, share, and boot, as described. 2d, The arrangement of the V-shaped fender with the harrow teeth, and with the devices included on the first claim.

47. ELASTIC FRICTION ROLLER; A. A. Moss, Philadelphia, Pennsylvania.

Claim—The elastic friction apparatus described, the same consisting of the ball or sphere, spring, and case or hole, arranged in relation to each other in the manner described, irrespectively of the plate or the conical form of the spiral spring.

48. PIN-STICKING MACHINE; J. W. Naramore, Derby, Connecticut.

Claim—1st, Operating the driver or drivers and the crimping and feeding apparatus, or any portion of the same, by means of a clutch or clutches, carried by a constantly rotating shaft, and thrown into gear therewith, to effect such operation by the action of the sliding bed or pin-carriage as the latter, after having received the pins, completes its movement to the necessary position for the sticking operation. 2d, The combination with a single reciprocating sliding bed or pin-carriage and a single conductor, of two drivers, and two sets of crimping and paper-feeding apparatus, arranged on opposite sides of the mouth of the conductor in such a manner that the said bed or carriage, in every movement in either direction, is caused to be filled with pins from the conductor, and to convey them to a proper position relatively to one or the other of the drivers, to be thereby driven into the paper supplied, and crimped by its respective feeding and crimping apparatus, whereby I effect a saving of the time heretofore lost in running the bed twice under the conductor to be once filled. 3d, Effecting the combination between the sliding bed or carriage and a clutch, carried by a constantly revolving shaft, to operate a driver, a crimper, and a feeding apparatus, or either of them, by means of a toothed lever, a spring, notched slide, or plate, with an inclined edge and a sliding tooth, the whole applied and operating to permit one, and only one, revolution of the loose portion of the clutch, and hence but a single operation of the part or parts driven by it.

49. HAND PRINTING PRESSES; A. and B. Newbury, Windham Centre, New York.

Claim—The arrangement and combination of the slotted frame, adjustable bar, platen, roller frame, and rotating ink table, as described.

50. FLOUR-BOLTS; Ellis and Addison H. Nordyke, Richmond, Indiana.

Claim—1st, The band encircling the shaft, in combination with the spring catches, for the purpose described. 2d, Making the movable slide in two parts, jointed, as set forth.

51. CLOVER-HULLERS; Anthony Overocker, McHenry, Illinois.

Claim—The combination of the concave and cylinder with the adjustable sliding door, in the manner described.

52. MANUFACTURE OF HOES; Andrew Paterson, Birmingham, Pennsylvania.

Claim—The combination of the two jaws which clasp the blade with the head and the blade, arranged as set forth.

53. PIANO HAMMERS; John Percival, Auburn, New York.

Claim—Constructing and arranging the cushion forming the elastic covering to the hammer-head, as described.

54. SETTING GAS METRES IN THE WALLS OF BUILDINGS; Albert Potts, Philadelphia, Pennsylvania.

Claim—The manner described of adjusting a gas metre to an auxiliary case of the character specified, so that the matter is applied to a building in a neat and a secure manner, and, at the same time, the examination of the same, to ascertain its condition or the amount of gas consumed, from the outside of the building, is rendered practicable and convenient.

55. MODE OF REGULATING THE EXHAUST IN LOCOMOTIVE ENGINES; Thomas B. Quigley, Galion, Ohio.

Claim—1st, The sliding throttle-valves, when combined with the exhaust pipes of a locomotive engine, in the manner specified. 2d, The sliding-box with apertures, in combination with the chest, as set forth.

56. APPARATUS FOR PUNCHING STEREOTYPE PLATES; D. B. Ray, Galena, Illinois.

Claim—The arrangement of stamping bars, D, upon A B, when provided with the characters to be printed or stereotyped, so that they will all work to a common centre, and imprint the characters upon the face of the type-metal, in the manner set forth. Also, arranging upon the end of bar, F, knives, for the purposes specified.

57. TRUNNION BOX-LINING FOR OSCILLATING ENGINES; John A. Reed, Jersey City, New Jersey.

Claim—The employment, in combination with the conical trunnions of slit cap-like linings, applied to the boxes with screws and nuts, or other equivalent means of forcing them up towards the sides of the cylinder, as described.

58. ELASTIC RAILROAD FROGS; George P. Sanburn and Willis Mansfield, New Haven, Connecticut.

Claim—An elastic frog, constructed of layers of plate metal and wood, in the manner specified, and either with or without layers of vulcanized rubber. Also, constructing an elastic frog with end slots, suitable to receive the lower flanch and neck of a rail, as specified, whereby the frog may be kept in alignment.

59. PROTECTING SURFACES OF ARTICLES OF IRON; Thaddeus Selleck, Greenwich, Connecticut.

Claim—A horse-shoe, or other article, as indicated, made by uniting Franklinite pig-metal with the surface of iron, as set forth.

60. REVOLVING FIRE ARMS; Horace Smith and D. B. Wesson, Springfield, Massachusetts.

Claim—The wedge on the top of the nose of the hammer, the spring, and stop-bolt, when combined for the purpose and operating in the manner described.

61. IRONING-PAN FOR RANGES OR STOVES; James Spear, Philadelphia, Pennsylvania.

Claim—An ironing-pan, constructed with a perforated bottom, in the manner described.

62. PICKER-MOTION FOR POWER LOOMS; Wm. Steams, Manchester, New Hampshire.

Claim—Extending the picker-staff down through and below the rocker, and through the rail. Also, the rocker, made to receive the staff, in the way and manner described. Also, in combination with the rocker, the hook, whether made separate or cast on the rocker, for the purposes set forth. Also, making the picker-staff adjustable in the rocker, in the manner described, or in some equivalent manner. Also, making the stud surrounded by the coiled spring, smaller in the middle than at the ends, to allow the spring to contract in diameter in the middle as it is drawn in working. Also, making that portion of the stud surrounded by the stationary end of the coiled spring permanent or stationary, and that portion surrounded by the moving end of the spring to revolve, to facilitate the working of the spring.

63. SCALES FOR WEIGHING; Joseph W. Strange, Bangor, Maine.

Claim—1st, Arranging the beam in such a manner that the several indications or scales marked on the same, can be brought before the eye of the operator, by turning the beam. 2d, The arrangement of the socket, so that its end forms the common index-pointer for the several indications marked on the sides of the beam, as specified.

64. GAS RETORTS; William Stratton, Philadelphia, Pennsylvania.

Claim—The employment of an upright partition dividing the retort into chambers, in the manner set forth.

65. PHOTOGRAPHIC CAMERAS; John Stock, City of New York.

Claim—1st, The arrangement of the front plate of a camera, to which the lens-tube is attached in such a manner that the centre of the tube may be moved in any desired position, for the purpose and in the manner specified. 2d, The arrangements of the plates, 5 and 8, for the purpose described. 3d, Attaching the ground glass-holder to the end of the camera, and the manner of supporting the weight of the same, as specified.

66. COTTON AND HAY PRESSES; Elam Stockbridge, Houston, Texas.

Claim—The arrangement, in combination with the horizontal ropes or chains, vertical windlass, horizontal toggles, and horizontal follower of the auxiliary horizontal ropes or chains, in the manner set forth.

67. CHURN; Josiah Stubbs, Dublin, Indiana.

Claim—Operating the butterfly wings with the single crank confined to one side of the cylinder, being made to cross the body of the cylinder obliquely to effect this movement, in the manner set forth.

68. MERCURIAL BAROMETERS; Guiseppe Tagliabue, City of New York.

Claim—The external slotted sleeve gauge, applied in combination with the cistern or lower limb of the barometer, and with the adjustable scale, as described.

69. BAGASSE FURNACES; Louis Tregre, of the Parish of St. John the Baptist, Louisiana.

Claim—The employment of a double feeder, arranged with springs through the blades of the lower

feeder to allow the hot air from the furnace to pass from the lower feeder to the upper feeder, for the purpose set forth. Also, arranging between the two feeders an intermediate chamber to receive and retain the bagasse as it passes from the upper to the lower feeder, and constructing the upper feeder of larger size than the lower feeder, with or without an increased number of blades, or in an equivalent manner. Further, introducing an independent current of hot, dry air into the chamber, between the two feeders.

70. Head-block for Saw-mills; Jacob W. Truox, Richford, Vermont.

Claim—1st, The combination and arrangement of the ratchet-wheel, setting lever, cam wheel, gauge wheel, and spur-wheel, with the spring-latch, in the manner specified. 2d, The clamps, the lever, and eccentric lever, arranged as specified.

71. Spring-snap for Bridle-reins; Marianus X. Tschus, Bloomington, Illinois.

Claim—The combination of the two in one, in the manner described.

72. Cast Iron Tires for Railroad Wheels; Levi B. Tyng, Lowell, Massachusetts.

Claim—1st, The wedge-shaped braces, arranged in the chamber between the rims of a hollow cast iron tire, so that the chamber is continuous throughout. 2d, In combination with the continuous chamber, I claim the groove in the inner rim, arranged as described. 3d, Arranging the ribs alternately on the inner and outer rim, for the purpose of strengthening them without tying them together, as described.

[This inventor has solved the question, to construct hollow chilled cast iron tire for railroad wheels, in such a manner that they combine lightness and durability.]

73. Mode of Propelling Locomotive Engines on Railroads; Wm. W. Virdin, Baitimore, Maryland.

Claim—The placing of the friction wheels under the driving wheels of locomotives, or other vehicles, in the manner described.

74. Mode of Braking Locomotive Engines on Railroads; Wm. W. Virdin, Baltimore, Maryland.

Claim—The introduction of air into the cylinders of locomotives, in manner as set forth, and for the purpose of offering a yielding resistance to the movement of the piston, and by this resistance overcome the momentum of the train.

75. Ring and Traveler Spinning Machines; Joseph W. Wattles, Canton, Massachusetts.

Claim—The combination and arrangement of the bearing annulus with the ring or its traveler-carrier, in the manner and to operate with the traveler, as described.

76. Machine for Boring Post-holes in the Earth; John S. Wertz, Middletown, Iowa.

Claim—1st, The arrangement and combination of the screw-shaft, cross-head, grooves, pinion, and toothed cylinders, B, as described. 2d, The arrangement and combination with the cylinders, B, of the shaft, F, and rotary scrapers, as described. 3d, The arrangement and combination with the frame of the jointed bars, sectors, and adjusting rods, as described.

[Two toothed cylinders and an auger are used in this invention, in connexion with rotating clearers and an adjustable framing, so that post-holes may be sunk in the earth by horse or other power, very expeditiously.]

77. Corn Planters; J. W. West, Hillsboro', Ohio.

Claim—The arrangement of cords, with the pulleys working in arms for operating the slotted plunger and seeding bar, in the manner set forth.

78. Manufacturing Machine and Animal Cards; William Wheeler, West Poultney, Vermont.

Claim—The construction and arrangement of the sheet metal backs and wire-teeth, in combination, as described, when united by solder applied thereto, by immersion or otherwise.

79. Alarm Attachment for Tills; E. B. White, Nashua, New Hampshire.

Claim—1st, The bolt-plate provided with bolts connected by a joint to the box, and connected to a bell-striking apparatus, in connexion with the keys and a stop applied to the till, as set forth. 2d, In combination with the bolt-plate, bolt, and keys, the bars and screws in the parts of the keys, when the bolt-plate and bar are both connected with the lever on the bell-striking apparatus in any proper way. 3d, The employment or use of the sliding plate, combined and arranged with the bolt-plate and stop, to operate automatically. 4th, The employment or use of a supplemental spring fitted in a socket, or otherwise arranged to resist the movement of the bar, when said bar is used in connexion with spring bolts, as described.

80. Churn; Loren J. Wicks, Racine, Wisconsin.

Claim—1st, The combination of the box, A, the pipe, and the box, C, when the same are used in the manner set forth. 2d, Placing the box, C, over the box, A, and providing said box, C, with a screen and depending wire gauze partitions, in the manner specified.

81. Corn Planters; Henry Wiley, Frankfort, Ohio.

Claim—The arrangement of the gate, wheel, bars, hopper, rods, slides, and seed tubes, all constructed and operated as set forth.

82. Machine for Boring or Mortising Blind Stiles; Leonard Worcester, Lebanon, New Hampshire.

Claim—Combining the transversely reciprocating carriages, A A, with the cam cylinders, by means of the pairs of vibrating levers, in the manner set forth. Also, the notched plates for sustaining the stiles during the operation of mortising or boring the same, when the said plates are combined with reciprocating bearings, and other suitable mechanism, in such a manner that the necessary laterally reciprocating, and longitudinally feeding movements will be imparted to said plates. Also, combining the bearings of the bit-shaft with the reciprocating carriage, C, when the said shaft is so arranged with relation to the notched plates that the bits which project from the ends of said shaft will act upon the stiles as they are automatically presented to them. Also, the combination and joint operation with each other of the reciprocating carriages, A A, the notched plates, the pairs of levers, the cam cylinders, the reciprocating spring pawls, and the bit-carrying cylinder.

83. Corrugating Sheet Metal; W. E. Worthen and H. B. Renwick, City of New York.

Claim—The method of corrugating or moulding sheet metal by several dies acting in succession, in the manner specified, upon a sheet resting upon a bed, die, or dies, so as to cause the metal to conform to shape.

84. Self-acting Spinning Mules; John Wright, Worcester, Massachusetts.

Claim—The shaft with its screw-thread, arranged and applied as described, in combination with the carriage, the quadrant, and the shaft which drives the drawing rollers.

85. Manufacturing Corrugated Fabrics; Frederick Baare and J. G. Cawelly, Assignors to H. H. Day, City of New York.

Claim—The combination of two or more parallel series of corrugations in the same fabric, in such manner that the ridges of the adjacent series alternate. Also, combining rubber strands (one or more) with a textile material, in such manner that when the rubber contracts, the compound fabric gathers up into two or more parallel series of corrugations whose numbers alternate. Also, combining rubber strands with a textile material, in such manner that the strands are alternately secured to the fabric and left free therefrom at alternating parts of their length, so that the secured parts of one rubber strand corresponds with the free part of an adjacent one. Also, forming the fabric sleazy, at the division lines between the corrugations of adjacent series, so as to insure uniformity in the form of the adjacent extremities of the corrugations.

86. Gauge Cocks for Steam Boilers; F. W. Bacon, West Newton, Assignor to E. H. Ashcroft, Boston, Mass.

Claim—The combination of the throat-clearer with the throat and the screw-plug gauge cock, and so as to operate therewith, as specified.

87. Vulcanized Rubber Car Springs; H. W. Beins, Assignor to the New England Car Spring Co., City of New York.

Claim—The sectional gum car spring of two or more pieces, vulcanized in the manner set forth.

88. Ironing Table and Clothes Dryer; E. Culver, Assignor to self and R. N. Fife, Shelburne Falls, Mass.

Claim—The described combination of ironing table and clothes dryer, the table furnishing a support to the dryer, and a receptacle in which it may by stowed away.

89. Vulcanizing Rubber; A. K. Eaton, City of New York, Assignor (through G. S. L. Cummins, et al.,) to the Joslin India Rubber Company.

Claim—The use of the sulphide of manganese in the curing of india rubber, in the manner specified.

90. Railroad Brakes; O. F. Fuller, Lamoute, Assignor to self and W. M. Ferry, Ferrysburg, Michigan.

Claim—The brake blocks, pins, and levers, constructed and operating together as described.

91. Sugar Mills; J. R. Gates, Assignor to self, G. G. Dumont, and E. F. Sinker, Indianapols, Indiana.

Claim—The grooved friction rollers, when used for stripping the blade from the stalk, as set forth.

92. Butter-worker; Joseph Jones, Assignor to self and James G. Bryce, Philadelphia, Pennsylvania.

Claim—The use of the yielding beater, whether solid or constructed with an open or with a perforated bottom, enclosing an absorbing material, in combination with a traveling tray, as described.

93. Manufacturing Baskets; Lansing Marble, Assignor to self and T. North, Vassar, Michigan.

Claim—The described method of forming baskets by passing a series of staves or splints through proper guides over a mould, and pressing the same in the proper shape by a suitable piston and form, as set forth.

[By the aid of this machine baskets can be formed with less labor and stronger than by hand, all the staves or splints being kept in the proper places by guides until they are fastened, and the baskets being strengthened by hoops.]

94. Harvesters; Lewis and Jacob Miller, Assignors to C. Aultman & Co., Canton, Ohio.

Claim—Extending the finger or platform bar, one or both, far enough under the yielding bars, by which they are hung to the main frame, so that the two may be united by suspension rods, which allows them a yielding motion in one direction, and makes them rigid in another direction, and prevents the motions of the main frame from being communicated to the finger bar, as described.

95. Moulding Beads on Hollow Ware; Charles Neale, Assignor to Frederick Leibrandt and W. L. McDowell, Philadelphia, Pennsylvania.

Claim—Moulding for the production of beads, flanches, or other projections and ornaments on the outer sides of cast metal pots, kettles, and other vessels, so as to form the said vessels in two part-flasks, the pattern bed flanch, or other projecting ornament, being so constructed, arranged, and operated as to admit of its being drawn in and pushed out of the vessel pattern.

96. Hawse Pipe for Ships; A. S. Philips, Boston, Assignor to self and Isaac Adams, South Boston, Mass.

Claim—A tubular cable guide curved, as described.

97. Corn Planters; Peter Plater, Assignor to self and J. S. Fleming, Moore's Hill, Indiana.

Claim—The arrangement of the shield, hammer, sliding feed bar, lever, crank shaft, and spring, the whole being constructed as set forth.

98. Threshing Machines; John I. Rollow, Assignor to Charles C. Wellford, Fredericksburgh, Virginia.

Claim—The combination of the inclined carrier with the shoot and curved screen, the whole being constructed as set forth.

99. Machine for Pointing Nails and Spikes; Wm. Spink, Assignor to Oliver A. Washburn, Jr., Providence, Rhode Island.

Claim—The combination of the bunter, the pointer, and the spring with each other, and with the back piece and other parts of the reed machine, or with the corresponding parts of any other nail machines, constructed in the manner described.

100. Machine for Washing and Amalgamating Gold; George C. Wheeler, Graysville, Georgia, Assignor to self and George Calvert, Upperville, Virginia.

Claim—1st, The relative arrangement for united operation of the hopper, horizontally revolving vertical tubes, horizontally revolving rakes, and stationary washing vessels, B C. 2d, Making the receiver or washing vessel in two parts, B C, and combining with the part, C, an adjusting device, D, as described.

101. Device for Operating the Cut-off Valve of Steam Engines; W. W. W. Wood and Henry Howson, Assignors to John Rice, Philadelphia, Pennsylvania.

Claim—We limit our claim to causing the positive power of the engine to operate the throttle valve, by the employment of two vibrating, reciprocating, or rotating strikers, actuated by any positive movement of the engine, in combination with two inclined planes intervening between the said strikers, and the valve or appliances connected therewith, any governor being so connected to the strikers or to the inclined planes, that the movement of the governor caused by any increase or diminution in the speed of the engine, shall change the position of the inclined planes in respect to the striking, or that of the strikers in respect to the inclined planes, and that the latter may thereby be the intermediate means of regulating the extent of the opening of the valve to suit the speed of the engine while the actual movement of the valve is effected through one or the other of the strikers by the power of the engine itself, as set forth.

MECHANICS, PHYSICS, AND CHEMISTRY.

*On Embroidery by Machinery.** By George Wallis.

The object of this paper is simply to give a popular description of the leading features of the embroidering machine, and to illustrate its practical use and capabilities by specimens of textile decoration produced by it. A full and complete description of this machine would involve either the presence of a machine in full work, or such a series of elaborate drawings, diagrams, or models, as would render the task of description neither pleasant nor profitable. No attempt, therefore, will be made to do more than simplify the principle upon which the machine is constructed, and give such illustrations of its action and capabilities as may serve to show its superiority over, or indicate its inferiority to, the human hand in the production of embroidered effects. The diagrams used will be such simplifications of construction as will be best calculated to render that construction intelligible, and are in no way intended as illustrations of the complete mechanical structure of the parts described, or of their full action.

As an interesting branch of art-industry, embroidery by machinery is more wondered at than understood, and it is no uncommon thing to find the mechanical agent used in its production confounded with the various sewing machines which have recently come so largely into use for a variety of purposes. Machine embroidery may, as it did some ten or twelve years ago, stimulate the productions of hand embroidery, and to a certain extent, supplement them, but it is doubtful, to say the least, if it can ever supplant them. Excelling hand embroidery in accuracy of repetition, and in the production of the same design on both sides of the fabric decorated, it is limited in its range, alike as regards subject and the article to which it can be applied.

In variety of effect it can never compete with hand embroidery, and, although, as in the dress embroidered for Her Majesty, by the late Mr. Louis Schwabe of Manchester, the effects of the original drawing are given in all their variety, this has only been done at a great sacrifice of all the economic powers of the machine. When Mr. Schwabe first showed me this specimen in 1844, he said, "I was written to and asked if my machines would execute any design? I replied that any design which Her Majesty wished executed should be produced by them. When the drawing came I saw the mistake I had made, but resolved, cost what it might, that the work should be done and there it is." As an illustration of what can be done by the embroidering machine, the example is interesting, but as an illustration of its economic use, or its superiority over hand embroidery, it is worthless.

Having said thus much as to the true purposes of machinery as applied to embroidery, it may be useful to make a few introductory remarks on the subject of embroidery as an art of so ancient a character, that its origin is entirely lost.

* From the Jour. of the Society of Arts, No. 333.

The early history of embroidery is associated with the progress of civilization and refinement as an elegant employment for females; and one which, from a remote antiquity, exercised a large and abiding influence on ornamental art. It is the most primitive mode of textile decoration, and ranges at once from the simplest figure to the most intricate elaborations of a variety of materials requiring the skill of the needle-woman, with the invention of the ornamentalist. It is practised in one form or another wherever man has made any advance beyond the rude art of ornamenting his body by tatooing. The wonderful embroidery of the Peruvians, which so astonished their Spanish invaders, displayed surprising effects of color produced by the plumage of tropical birds, combined with threads of gold and silver. In all periods of the world's history, among the richest specimens of ornament dedicated to the service of ceremonial religion, we always find embroidery. In the Mosaic Tabernacle the embroidery of purple, blue, and scarlet was conspicuous, and the elaborate embroidery of sacerdotal vestments, especially those of the high priest, show how largely this sacrificial ornamental work was used in the early ceremonials of the Jews.

In the last chapter of the Proverbs of Solomon is an interesting picture of the virtuous wife, whose "Lamp goeth not out by night," and who "worketh beautiful vestments for herself,"—

> Her clothing is fine linen and purple.
> Her husband is known in the gates,
> When he sitteth among the elders of the land.
> She maketh him fine linen and selleth it;
> And delivereth girdles unto the merchant.
>
> Verses 22, 23, 24.

In the prophecy, by Ezekiel, embroidery is mentioned as the clothing of Jerusalem, represented under the figure of a woman.

> "I clothed thee also with embroidered work."
>
> Chap. 16; verse 10.
>
> "Thou wast decked with gold and silver;
> And thy raiment was of fine linen and silk and embroidered work."
>
> Verse 13.

The Egyptians used embroidery to a very great extent. The sails of their boats were of embroidered linen, and the wrappings of their dead were frequently thus decorated.

The Greeks attributed the invention to Minerva. Homer describes two of his heroines as engaged in embroidery—Helen, as depicting the combats of the Trojan war, and Andromache,—

> "In the chamber at the palace top,
> A splendid texture wrought on either side,
> All dazzling bright, with flowers of various hues."

The women of Sidon are said to have been noted for their skill in embroidery even before the Trojan war. Pliny attributes its invention to the Phrygians, hence the Roman name for embroidered garments,—*Vestes Phrygioniæ.*

It should be understood, however, that the word signifying "embroidery" is used by ancient writers as a generic term for all kinds of decorative work done by the needle. In later periods, the sense

was limited to peculiar effects produced by certain fixed methods, and in more modern times a still greater limit is understood.

The practice of embroidery in Europe was very largely extended during the mediæval periods, and was carried to great perfection for the personal adornment of royalty, the nobility, and especially in the service of the church. The vestments of the priesthood, hangings, veils, canopies, curtains, and other textile articles of use and decoration, were largely embroidered; indeed, the character of the work of this period was chiefly ecclesiastical, and the inmates of convents employed their time in this direction with remarkable results. Some of the most valuable illustrations of the manners and costumes of past ages have come down to us through the agency of the needle; and in proof of this it will be sufficient here to allude to those interesting records in embroidered work and tapestry, as coverings for the walls of rooms, and hangings for doors, windows, and corridors, in the execution of which the ladies of noble families beguiled their leisure hours. Family traditions, historical incidents, portraits, the sports of the field, and groups of natural objects, were all employed in the execution of textile ornaments for the decoration of apartments. In England this art was carried to a high degree of perfection, and in the execution of vestments, English work was so highly prized as to have been constantly sent out to Rome by command of the Pope. There can be little doubt that the skill in embroidered work displayed by our ancestors was the forerunner of several of our most common kinds of ornamentation. Paper hangings, for instance, were originally professed imitations of tapestry, the patterns having been first printed on canvass.

Ancient embroidery is divisable into three heads:—"*Low*" embroidery, in which the threads are laid flat on the ground of the work: "*Raised*" embroidery, in which the figures are brought into relief, and rounded by means of wool, cotton, parchment, or paper placed beneath the needle-work: "*Gimped*" embroidery, in which the figures are formed by cords of gold, silver, or silk and portions of velvet or satin, gold and silk.

Hand embroidery is still extensively practised in the East. The true Indian and Persian scarfs are embroidery work of floss or untwisted silk, and exceedingly rich effects are thus produced, as will be remembered by those who examined the Indian productions of this class in the Great Exhibition of 1851.

In Turkey and Greece embroidery with gold and silver thread, or richly-colored cottons, silks and velvets, is much used for robes and decorations. The embroideries exhibited by Turkey, in the Great Exhibition of 1851, were of a marvellous character in execution, and deserved much more attention than it is to be feared they received. As commissioner of one of the groups of Juries, I had to direct attention to them, and in the midst of so much that was excellent, the difficulty lay in selecting those most worthy of reward. The articles embroidered were all made up for use as clothing, and the jury for that class had therefore to undertake the work of adjudication. Such

was the difficulty of selection, that the task was nearly abandoned in despair, and nothing but an urgent demand on my part that so remarkable a display should have full justice done to it, induced the jury to proceed. From the system adopted by the Turkish authorities in collecting and registering the works, some of the best had to be passed over, and the jury finally reported:—"It is impossible to recognise, either by medal or honorable mention, many of those to whom such distinctions are justly due, as no names are given whereby the jury can take cognizance of the articles. Those cases which the jury have been enabled to recognise are selected as much for the facility for giving such recognition, as for the high merit displayed in the production, inasmuch as there are others deserving of the same consideration, could the jury have discriminated amid the vast collection of articles." The awards are curious, and all to women, except a prize medal to the Tailors' Association of Janina for Albanian costumes. Whether the daughter of the Turkish gentleman with an unpronounceable name ever received the awarded medal, or the girls Bukudgy and Istche, or the wives of Carabet and Tetzy got information of the "honorable mention" made of their embroideries, is a matter of speculation to this hour with those who desired to do them justice.

Probably the finest modern examples of pure embroidery in silk, unmixed with gold and silver thread, pearls or precious stones, are executed by the Chinese. Not only in execution, but in design and the fitness of the forms of the ornament to the material and purpose, the embroideries of the Chinese generally exhibit a great superiority to the usual examples of European skill. The extreme care taken with the work, especially in the more costly specimens, renders them very instructive examples of textile decoration. From 700 to 750 stitches may be counted in the space of a square inch. Some years ago I took the trouble to dissect some of the best examples I could meet with, and the more closely they were examined the more marvellous the work appeared. Some diagrams now before you show the peculiarities of treatment, and illustrate in some degree the arrangement of the stitches.

Of course, the leading Continental nations are producers of embroidery, especially France, but the styles adopted are usually either a re-production of the ancient methods, or imitations of Eastern productions.

This brief sketch of the progress of embroidery by hand, must suffice to introduce the special subject before us,

EMBROIDERY BY MACHINERY.

This has been effected to a considerable extent by the Jacquard and Draw looms, or rather effects in imitation of embroidery have been produced. With this, however, we have nothing to do, as machine embroidery, by the legitimate means of the needle, is the point which it is desired to explain and illustrate.

The first idea of the embroidering machine originated with M. Josué Heilmann of Mulhouse. His object was to combine accuracy of repetition over a large surface with economy of production. Selling it to

Messrs. Koechlin, also of Mulhouse, he developed the principle of its construction in their establishment, where it was first practically applied to manufactures. The invention appears to have been first brought before the public in the National Exposition of the Products of Industry, at Paris in 1834; but the machine was patented for England about 1829, and with all rights, &c., purchased from Messrs. Koechlin by Mr. Henry Houldsworth, of Manchester, by whom it was subsequently very greatly improved from time to time. The first successful use of the machines as improved was in the silk manufactory of the late Mr. Louis Schwabe, in the then Portland-street Mill, Manchester; Mr. Houldsworth, having made an arrangement with Mr. Schwabe, as a manufacturer in whose trade their powers would find most development. Here they were employed in embroideries for upholsterers, but chiefly in the "sprigging" of waistcoatings, to which they were peculiarly adapted, as will be shown in the course of the illustrations of the construction and action of the machine.

The leading principle of the machine in the production of a pattern is that of the pantagraph, by which a given form is copied to a fixed scale, in this particular instance to one-sixth the size of the guiding pattern.

The machine may be divided into *three* parts:—

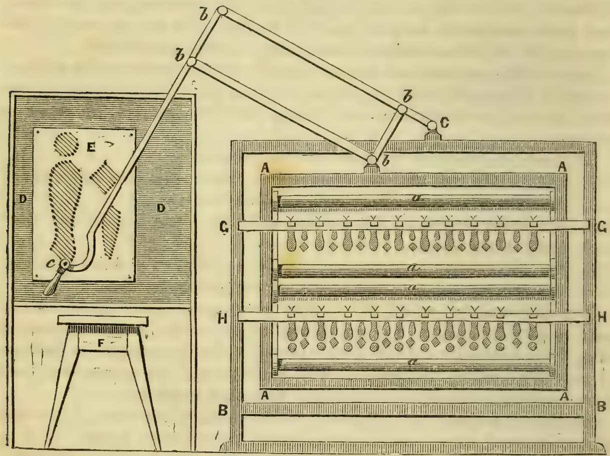
1. The pantagraph and the embroidery frame, attached upon which the fabric to be embroidered is stretched.
2. The arrangement of the needles and the pincers by which they act on the fabric.
3. The locomotive arrangement of the carriages by which the embroidering threads are carried through the fabric.

The diagrams by which the constructive principle of these several parts will be illustrated are not drawn to any scale or relative proportion, but are simply intended to convey, as far as possible, a distinct idea of the leading features of the machine and its operations, and they have been drawn and arranged with that view only.

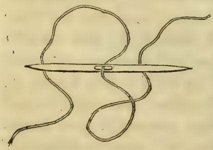
In Fig. 1 we have an elevation of the leading features of the machine, divested of all detail, giving only its essential parts. A, A, A, A, is the embroidery frame, within which the fabric to be embroidered is stretched in two divisions, an upper and lower one, upon rollers *a*, *a*, *a*, *a*. This swings from the outer frame B, B, B, B, at the pivot of the pantagraph C. Every person who understands the action of an ordinary pantagraph, will at once understand that if a figure of suitable design and size is fixed on the vertical plane D, D, as shown in the pattern E, all that will be required in order to copy this pattern to a fixed scale on the plane A, A, A, A, will be to move the pointer c of the lengthened side of the parallelogram *b*, *b*, *b*, *b*, by the handle attached to it. The angles of this parallelogram will become acute or obtuse, just according to the motion required to bring the frame A, A, A, A, into its proper relative position. To effect the copying of the pattern E by a series of stitches, a drawing generally six times the size of the pattern to be embroidered, is made upon a piece of stout paper, or a plate of tin. Each stitch is arranged to this scale, and a hole punched in the paper or plate at each end of every stitch.

Into this hole the pointer of the pantagraph is inserted before each stitch is taken. This point is moved backward and forward across the pattern, upon the system of stitches laid down, by the embroiderer seated on the stool F; and with each motion the needles are drawn backward and forward through the fabric by a corresponding action of the carriages, on the frames of which the pincers which hold the needles are fixed, as indicated; G to G in the upper tier thus embroidering the upper piece of cloth, and H to H in the lower tier, by which the fabric fixed upon the lower pair of rollers is embroidered. The pattern E is thus repeated one-sixth the size, each needle in operation executing a repeat, and the pattern when finished extends the whole width of the fabric at one operation.

Fig. 1.



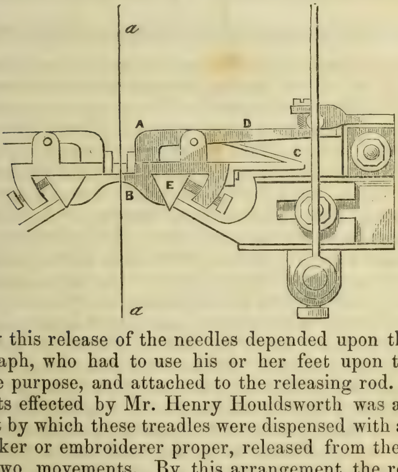
The arrangement of the needles, and the mode by which they are alternately held and released must now be noticed. The needle-holder or pincers act in a manner analogous to the human hands, working from each side of a framework of cloth, placed in a vertical position, the needle being a double-pointed one, with an eye for threading the silk in the middle, thus:—



The pincers are arranged, as already stated, in a double row on two tiers across the frame work of the carriages on each side of the embroidery frame, and project over, so as to come in contact with the fabric when stretched upon it. (See Fig. 3, *a*, *b*, *c*, *d*.) They are placed at one inch and a half from each other, and the larger machines have as many as 75 in each row. The construction of these pincers may be illustrated in profile by Fig. 2.

A is the upper jaw of the pincers, which is kept down upon the needle by the action of the spring, C. By this spring the upper jaw is brought back into its place after the end has been pressed down at D, to release the needle after it has pierced the fabric, (as shown in section at *a a*,) and been received by the opposite pincer. B is the lower jaw, which is, of course, fixed to the frame. The prismatic rule E runs the whole length of each series of pincers, and sustains them, in a perfectly true and corresponding position. The arrangement for the release of the needle after it has been driven through the fabric cannot be easily explained; it must, therefore, suffice to say, that the upper jaw of the pincer is pressed down at the proper time by the action of a rod on the lever end D, and the needle thus released, after having passed through the fabric, is held fast by the opposite pincer, the thread being thus carried to its full tension, as shown in Fig. 3 at F, and then brought back again to the fabric to be taken up in the same manner by the pincer from which it had been released, again to return at each motion of the pantagraph handle indicating another stitch.

Fig. 2.



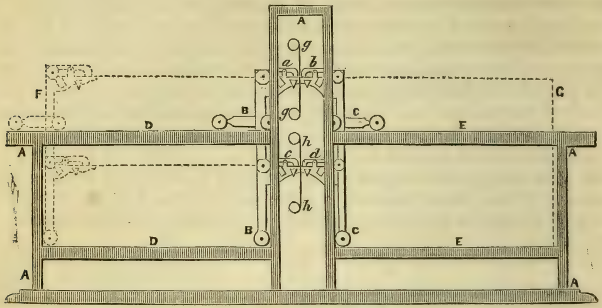
Originally this release of the needles depended upon the worker of the pantagraph, who had to use his or her feet upon treadles provided for the purpose, and attached to the releasing rod. One of the improvements effected by Mr. Henry Houldsworth was a mechanical arrangement by which these treadles were dispensed with and the pantagraph worker or embroiderer proper, released from the duty of attending to two movements. By this arrangement the releasing rod is acted upon by a clock motion, which is brought into play at the instant the carriage is driven against the frame work when the needle passes through the fabric.

The locomotive arrangement of that portion of the machine which carries the pincers and needles, may be understood in its elementary form by a reference to Fig. 3.

A, A, A, A, A, represents the structural frame-work of the machine, and is of iron; B B and C C the carriages acting on each side of the fabric; *a b* and *c d* indicate the position of the pincers carrying the

needles. These carriages run on a species of railway along the horizontal lines D D and E E, and are required to be most accurately fitted. The section of the fabric stretched in a vertical position on the rollers *g g* and *h h*, and passing between the upper and lower tier of pincers, gives the centre line of the diagram.

Fig. 3.



We will now assume that the needles being threaded and fixed in the pincers *b* and *d*, are pushed through the fabric represented as stretched upon the rollers *g g*, *h h*. The needles are released from *b* and *d*, and seized by the pincers *a* and *c*. The carriage B B is then drawn backward to F, until the threads are all drawn equally through the fabric. The needles being threaded in pairs, that is to say, with a thread of double length, these threads are drawn up to their full tension at once. This supersedes the knotting of the thread to prevent its being drawn through the cloth. The embroiderer sitting at the pantagraph moves the point for the first stitch, as shown in Fig. 1 at E, the carriage B B is brought back to the fabric, and the needles forced through into the jaws of the pincers *b d*, again they are released from *a c*, and being duly fastened upon by *b d*, the carriage C C is drawn along the frame until the thread is again at its full tension, when the carriage reaches G. Stitch the first is then complete.

The pantagraph pointer is again moved for another stitch on the enlarged pattern E, Fig. 1, and again the process of bringing up the needles to the fabric—their passing through—their release on one side and their seizure on the other is repeated, and so the work goes on until fresh needles and thread are required, when the same course is repeated in the putting in, and starting the work at the same point at which the last stitch of the former thread left the work incomplete.

Each machine is usually worked by three young women and three or four girls, the latter being employed to thread the needles and prepare them for the machine, that a supply may be always on hand. One young woman—who is generally the most experienced, and acts as the "captain" of the machine—attends to the pantagraph, criticises the work, and directs the motions of the workers of the carriages, who push backward and forward the rows of needles. With an intelli-

gent "captain," quick and skilful workers, and rapid threaders, an elaborate pattern, and a machine in good working order, I know nothing in manufactures more interesting than the embroidering machine. The pattern grows so rapidly under its action; every stitch tells toward the final effect; and the result is at once so satisfactory, that the operation appears to be the realization of the thought of the workers direct from their minds, and with no more mechanism than is necessary to realize that thought.

(To be Continued.)

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*Heat-conducting Power of Metals.**

An elaborate paper, which cannot fail to be of utility to our industrial community, has been communicated to the Royal Society by Professor F. Crace-Calvert and Mr. Richard Johnson on the "Relative Power of Metals and Alloys to Conduct Heat." Before describing the process followed and examining the results obtained, it is necessary to state that they made a great number of experiments, with the hope of solving the important chemical question—are alloys simple mixtures of metals, or are they definite compounds? With this view they operated on a large number of alloys and amalgams, convinced that if the chemical nature of alloys and amalgams is still enveloped in darkness, it is because they have been prepared with impure or commercial metals, and not made in equivalent quantities. The consequence has been that as metals have only a slight affinity to each other, and as the definite compounds which they have a tendency to form were mixed with an excess of one of the metals employed, the alloys produced have presented properties which could lead to no information as to their nature. These difficulties have been increased by the fact that in many alloys, such as those of copper and tin, or copper and zinc, the metals have a tendency, when allowed to cool slowly, to form several crystallizable compounds differing in their composition in the various parts of the alloys, the less fusible being on the exterior and those more so in the interior of the mass. The impurities existing in commercial metals are often so large as considerably to modify the property of their alloys; for they found in their researches that if 1 per cent. of a metal be added to 99 of another, it alters its conducting power most materially. To avoid these causes of error they composed their alloys of pure metals, and employed definite proportions.

The apparatus used appears in every way calculated to give reliable results, and Messrs. Calvert and Johnson's remarks are certainly entitled to be considered the most complete which have yet appeared on the subject. They provided a deal box (105 millims. in width, 165 millims. in length, and 220 millims. in height), with a cover, and painted white internally and externally. Inside this box are two vulcanized india rubber square vessels, the sides of which are 15 millims. thick. The larger vessel measures internally 52 millims. on the side, and 125 millims. deep, and is capable of containing 336 cub. cent. of

* From the Lond. Mining Journal, No. 1230.

water. The smaller vessel is 27 millims. on the side and 125 millims. deep, and has a capacity of 90 cub. cent. These vessels are painted white, and surrounded with wadding; and, still further, to prevent any radiation of heat, a deal board is placed between the two vessels. So little heat is radiated from the larger vessel when it contains 200 cub. cent. of water at 90 deg. to the smaller vessel containing 50 cub. cent. at 16 deg., that in a quarter of an hour, the time required for their experiments, the water in the vessel did not rise one-tenth of a degree centigrade. Therefore all sensible radiation and conduction was avoided, and the rise of temperature in this vessel during the experiment must have been entirely due to the heat conducted by the square bar of metal used. This bar is 6 centims. long and 1 centim. square, and is so arranged in the experiment that 1 cub. cent. is in the larger vessel; 1 cub. cent. in the smaller vessel; 3 cub. cent. are covered by the sides of the boxes through which it passes; and the last 1 cub. cent. is covered with a piece of vulcanized india rubber tubing, and the whole made secure from any leakage by lining the sides of the holes through which the bar passes with a varnish made of caoutchouc dissolved in benzoine. All being ready for the experiment, 50 cub. cent. of water, at the temperature of the room, are poured into the smaller vessel, the boxes covered, and each provided with a very sensitive thermometer, and 200 cub. cent. of boiling water are poured into the larger vessel by means of a funnel; the temperature of the liquid falls to 86 or 88 deg., but is again raised to 90 deg. by a small jet of steam generated in a flask, the water in which is kept boiling during the whole experiment. The conducting power of the metal being tested is noted with the greatest care.

The relative conductibility (taking silver at 1000) of the several metals is—gold pure, 981; gold with 1 per cent. of silver, 840; copper rolled, 845; copper cast, 811; mercury, 677; aluminium, 665; zinc rolled, 641; zinc, cast vertically, 628; zinc, cast horizontally, 608; cadmium, 577; malleable iron, 436; tin, 422; steel, 397; platinum, 380; sodium, 365; cast iron, 359; lead, 287; antimony, cast horizontally, 215; antimony, cast vertically, 192; bismuth, 61. For mercury and sodium they employed a very thin sheet iron box, the internal dimensions of which were exactly those of the square metallic bars they usually employed, and of the conducting power calculated, but the figures are very near the truth. It will be seen on reference to the figures for rolled and cast copper that the molecular condition of metals has an influence on the conductibility, and the influence of crystallization is apparent from the difference of the results obtained from zinc cast vertically and cast horizontally.

Glaze for Earthenware.

M. Hardsmuth proposes the following in place of the ordinary lead glaze:—Take boracic acid, 15 lbs.; calcareous spar, 5 lbs.; clay, 5 lbs.; wood-charcoal, 1 lb. Powder the mixture, and calcine to complete fusion; allow it to cool; powder again and apply it as the common lead glaze is applied.—*Cosmos.*

*New Chemical Balance.** By Mr. J. B. Cooke, of Liverpool.

The balance is an instrument of prime necessity to the exactitude of the results sought for in the operations of the chemist. But it is also a very expensive piece of apparatus, and its delicacy requires it to be guarded with the utmost care from the effects of damp, and the other vapors and fumes incidental to a laboratory. The following is the description of an instrument which has been in constant use for more than a year, and which is at once sensitive, effective, inexpensive, and not liable to injury. It weighs quantities amounting to 2400 grains with an accuracy unmistakeably distinct to the $\frac{1}{10}$th of a grain.

Though freely exposed to an atmosphere which in twelve hours covers a polished iron surface with rust, and which is often loaded with fumes of hydrosulphuric and other acids, it is now as sensitive as on the day of its construction.

The materials of which this balance is composed are to be found in every laboratory. Their first cost need not amount to 5s., and they can be put together by the chemist himself in the course of two or three hours, so as to be in perfect working order.

To those operators whose object is the attainment of accuracy with the smallest expenditure of means, it is hoped that a desideratum is here supplied, although some of the points usually considered essential to a good balance appear to be disregarded.

The beam is formed of glass tube. A piece of barometer tubing of 12 or 18 inches in length, or even the full length of a barometer tube, if economy of space is not important, may be employed. Another glass tube of about 3 inches in length, and of diameter and thickness proportioned to the weight it is destined to bear, is attached to the beam tube at right angles, at about the middle point of each. Exactitude in any of these particulars is not essential. The attachment may be made by any convenient means, say by fine iron wire covered afterwards with sealing-wax melted on to it.

If a portable balance be desired, a suitable stand must, of course, be provided; but if the instrument be intended to occupy a permanent position, it may be made to work upon an open shelf, and the present description applies to the latter circumstances.

Two other glass tubes, of about two inches in length, are cemented longitudinally upon the surface of the shelf, parallel to and at a distance of $1\frac{1}{2}$ inches from each other.

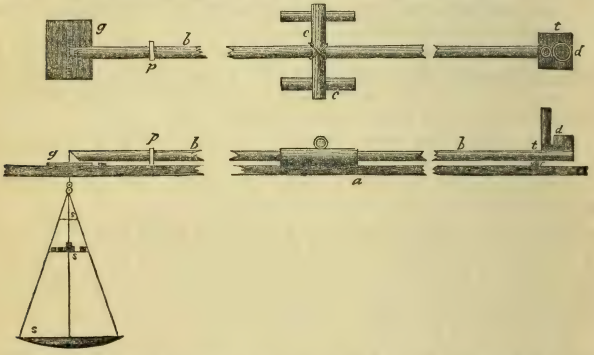
They must be equal to each other in diameter, which must be greater than that of the beam tube, or they must be raised equally to some small distance above the surface of the shelf, so that when the transverse tube attached to the beam is placed across and upon them, the beam itself, lying between and parallel to them, shall be raised at its centre at least $\frac{1}{4}$-inch above the shelf. The three small tubes should be selected of good shape and polish.

By this arrangement the beam, when in equilibrium, is supported

* From the Mechanics' Magazine, April, 1859.

upon two points, which, owing to the roundness, smoothness, hardness, and chemical inertness of the material, approximate closely to mathematical points not liable to injury from oxidation or friction. Knife-edges working upon planes of whatever substance, are not theoretically so perfect in action as the above *points* of support, and it would be difficult with the finest art to make them practically more sensitive.

A piece of sheet-copper is fastened on to the shelf under the beam near each of its ends. An edge of each piece of copper, running transversely to the shelf, is turned up at right angles to serve as a support at such a height that, when one end of the beam, loaded with its full weight, is resting upon one of them, the other end may be separated from its resting place by about $\frac{1}{20}$th of an inch. If the under-surface of the beam be blackened about these places of support, the separation shows very distinctly against a white surface placed behind.



The weights, and substance to be weighed, are both applied at the same end of the beam ; the other end being compensated by a constant counterpoise ; a peculiar form of scale pan is therefore required. It is convenient to have three tiers of pans hung in a pyramidal form at a suitable distance from each other by the same three silk strings. The largest and lowest is destined for the substance to be weighed. The middle one in size and position for the larger weights, and the smallest and uppermost pan contains the weights below 10 grs. This compound scale pan is suspended by a bent wire to a loop formed at one end of a short silk thread, which, passing vertically through a small hole in the shelf, and bisecting the end-section of the beam tube, is cemented with sealing wax on the upper surface of the tube. The thread should lie in a slight notch filed on the upper circumference of the end of the beam, and should hang freely from it, the lower circumference being ground away to prevent contact. The thread must also of course be carefully protected against contact with the sides of the opening in the shelf. The better way is to make an opening of about one inch square through the wood, and afterwards to cover over the greater por-

tion by four slips of window-glass crossing each other, and leaving only a small hole in the centre for the thread. If this opening be large, the balance will be affected by currents of air which always occur upwards or downwards in such circumstances. The surface of the shelf between the centre of the beam and that end of it to which the pans are hung, is divided into 10 equal parts by ink lines; and a platinum rider weighing $\frac{1}{10}$th grain is applied to this arm of the beam, and by traversing over each division marked on the shelf causes the variation of $\frac{1}{100}$th of a grain, and dispenses with the use of weights smaller than $\frac{1}{10}$th grain.

The sensitiveness of a balance is proportional to the approximation to each other of the centres of suspension and of gravity. In the present instance, the centre of suspension is the central point of the mid-section of the small tube attached to the beam, and since the weights of the beam itself and of the scale pans and their contents, are referred to a point much below this, some provision is required by which the centre of gravity of the whole mass may be considerably raised, and its position nicely regulated. The provision required is found in the mode by which the compensation is applied at the end of the beam destitute of scale pan.

On the upper side of the compensation-end of the beam is cemented horizontally with shell-lac, a table of window-glass of about 1 inch square surface. On this table again are cemented, by the same means, in vertical juxtaposition, two glass tubes; one about 3 inches high and $\frac{1}{4}$-inch in diameter, the other 1 inch high and $\frac{3}{4}$-inch in diameter. A quantity of dry pure mercury is then poured into the tall tube until the beam, whose scale pan is loaded with about $\frac{2}{3}$rds the weight which it is destined to carry, is nearly in a state of equilibrium. If the tall tube be sufficiently high and narrow, it will then be found that the centre of gravity has risen above the centre of suspension, as will be evidenced by the setting of the beam at either end indifferently according as it is placed.

Mercury is now poured gradually into the shorter tube, and after each addition weights are added in the scale pans to produce equilibrium. By every such addition the centre of gravity will be proportionally lowered, and may be brought with the utmost nicety within any assignable distance from the centre of suspension.

The adjustment will suffice for the purpose of the balance, when the transference of the rider over one division of the shelf towards the centre of the beam shall raise this end of the beam from its supports, and the replacing of the rider in its former position, shall restore the preponderance of the weights, and when on frequent trial this is the invariable result.

The balance is thus left with an extremely small amount of overpoise. The substance to be weighed is placed in the lowest pan. Weights are removed from the upper pans, and ultimately the rider is moved over the arm towards the centre, to the point at which the beam is first caused permanently to resume its normal position. The sum of the weights removed, together with the number of degrees passed over

by the rider reckoned as $\frac{1}{100}$ths of a grain, will be the weight required.

The advantages claimed for this balance are, easy construction, cheapness, non-liability to injury from exposure or rough handling, the whole operation of weighing being confined to one end of the beam without loss of sensitiveness, and the separation of the large from the smaller weights.

The engravings illustrate, in plan view and side elevation respectively, the new balance. *a* is the shelf; *b*, the beam; *c c c*, three small tubes; *d d*, tubes for mercury; *s s s*, three scale pans; *g*, glass plates to cover; *h*, hole in shelf; *p*, platinum rider; *t*, small table; and *r r*, copper rests.

The method of mounting is not inferior in sensitiveness to that of the best constructed instruments, and the limits of its sensitiveness are far from being reached in the specimen above described. As an illustration of this assertion, the following rough experiment is adduced. The writer constructed a balance, of which the beam was a tube of thick glass 22 inches long, and 1 inch in external diameter, and weighing alone $1\frac{3}{4}$ lb. The scale pan was loaded with a weight of 1 lb. The compensation was then readily effected with mercury to such accuracy that the translation of a platinum rider weighing $\frac{1}{10}$th gr. along the beam, over a space equal to $\frac{1}{10}$th of the length of the arm, sufficed to change the preponderance in favor of the one arm or the other, according to the direction of its transference. This roughly-formed balance, therefore, which, exclusive of the scale pan, did not occupy two hours in construction and preparation for use, was sensitive to a weight of $\frac{1}{100}$th of a grain, or to $\frac{1}{700000}$th part of the weight to be estimated, and about $\frac{1}{2000000}$th part of the whole weight supported on the fulcrum.

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*Supply of Coal.**

M. de Carnal, one of the greatest owners of coal mines in Prussia, in a statistical work on coal digging, states that the quantity of coal dug in 1857 amounted to 125,000,000 of tons, a mass which piled up 6 ft. high, would cover a geographical square mile. The lands from which the coal is procured, may be estimated at 8000 square miles, and the mean depth of the beds of coal at about 31 feet. The mass of coal, then, known to exist would form a cube of 10 miles. If we compare this enormous bulk of coal with the quantity annually consumed, we may confidently affirm that there is enough to last for 36,000 years. The calculation of 31 ft. for the mean depth of the beds is, perhaps, too low, for the coal fields of Liege extend to 55 ft., those of Staffordshire to 151 ft., and those of Ruhr to 134 ft. The coal dug in 1857 amounted in value to £37,500,000 sterling, a sum far beyond that realized by the digging of the precious metals. In England some calculations have been made with regard to the yield of coal in our own country, according to which the coal fields of Great

* From the London Mining Journal, No. 1236.

Britain yield 63,000,000 tons of coal per year. A better idea of the immense commerce of England could not be formed than by stating the fact that at Manchester and its environs a motive steam power equal to 1,200,000 horses is constantly maintained, to support which there are consumed 30,000 tons of coal per day, or 9,500,000 a year. In the manufacture of salt alone about 3000 tons are consumed per day, or 950,000 a year. The Transatlantic steamers from Liverpool and other ports consume 700,000 tons per year, and the manufacture of gas absorbs 10,000,000 tons per year. The export of coal from England reached, in 1858, 6,078,000 tons. It is estimated that England alone could furnish enough coal for the consumption of the whole of Europe for 4000 years.

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*How Great Guns are Made.**

In our last week's number something was said about the quality and character of iron requisite for producing sound heavy guns, and the experiments made at Woolwich during the last two years were referred to. This week we propose to give further information on the important subject, and more especially in reference to the furnaces and other appliances connected with the Woolwich factories. A 68 ℔. gun, when finished, is 17 feet long, 28 inches in diameter at the breech, and weighs 95 cwt. As guns of this description are cast vertically, and require a "dead head" of considerable magnitude in order to insure sufficient density, it may be imagined that the furnaces are matters of important consideration. In practice it was found advisable to use two furnaces in the melting of a sufficient quantity of iron for the production of one such gun as we have described. The Woolwich furnaces would each hold sufficient molten metal for the casting of one gun, but as it was not possible to charge with ten tons of pig iron at once, it was found better in every way to charge two furnaces with five tons, and melt simultaneously. The quality of the iron produced in this way was found to be superior to that resulting from one furnace, when a portion of the charge must have been melted first and the remainder afterwards. Repeated tests proved this fact to demonstration, and it is a practical point of much consequence. The Woolwich furnaces are partly constructed of Stourbridge fire-brick, but the beds are of a different material. The throwing in of old "carronades," "dead heads," and "pigs," was found to chip off, or to crack and destroy the fire-bricks, and a substitute for these, in the construction of the furnace beds, had to be found. A cheaper substance, and one which admits of easy repair, is now used. It is composed of equal parts of glass-grinders' sand and blackfoot sand. The former is the refuse from the Thames patent glass works, and contains a considerable admixture of fine particles of glass, and the latter is obtained from the sand pits at Charlton. These are amalgamated, rammed hard upon the foundation of the furnace, and, after the application of heat, form a vitrified surface,

* From the Lond. Mechanics' Magazine, April, 1859.

impervious to liquid iron. The sand furnace bed is, in point of efficiency and economy, immeasurably superior to that of fire-brick, and we strongly recommend it. With respect to the dimensions of the furnaces, it may be stated that they are about 22 ft. long, from centre of fire-grate to centre of chimney; 5 ft. 2 in. wide; and 2 ft. 6 in. in height from bed to crown. The fire-grate is 5 ft. 2 in. square, and open for the admission of air at the end of the furnace, and the chimney is 60 ft. in height and 2 ft. 6 in. square. The furnaces are always heated before receiving their charges, and when the latter are sufficiently fluid and hot, the molten streams from two furnaces, as we have stated, are made to flow through separate channels into one reservoir. Here they mingle and blend for a little time in one harmonious whole, so as to equalize any difference of temperature which may have existed prior to their being tapped. Metal is now ladled in small quantities from the reservoir for the purpose of casting testing bars, and a sluice door being opened the molten ocean courses its way down river-like into the centre of the gun mould, which is placed vertically, and muzzle upwards to receive it. Scoria and other impurities float upwards as the metal rises, and great precautions are taken to prevent their flowing with the iron into the "trunnions," which they would weaken, and thus render the whole casting useless. When the metal reaches to within a few inches of the guide shute, the flood-gates through which it flowed are shut for a minute until the shute is removed, and then again opened for the complete filling of the mould. In cooling there is a great subsidence of the metal, especially in the centre, but the hollowness thus produced is in the dead head entirely, and by no means deteriorates the gun. Everything is suffered to remain *in statu quo* for about three days and nights after the pouring operation. The mould is then opened, and the casting, usually perfect, is prepared by lathe and boring mill for proving, and mayhap for battle. Such is some account of the gestation and birth of a great gun, and which, in these non-piping times of war, may be acceptable to the public generally, and certainly must be to the scientific reader.

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*Bonelli's Electric Loom.**

At the meeting of the 7th ult. of the Académie des Sciences, M. de Senazcourt informed the members that M. Froment has completed important improvements in the electric loom invented by Chevalier Bonelli, director of the Sardinian telegraph, which figured at the Paris Exhibition of 1855, and a commission was named to examine it and make a report to the Academy. M. Chevreuil stated that he had been to see it at work, accompanied by the President of the Chamber of Commerce and other gentlemen, and had been astonished at the results obtained. The invention consists chiefly in replacing the Jacquard cards by a thin sheet of tin on which the design to be reproduced on the fabric is figured with varnish or isolating ink. The beat up of the

*From the Lond. Mechanics' Magazine, April, 1859.

batten brings a metallic comb, formed of small separate teeth, into contact with the design, when some of the teeth touch the varnish of the design, and others touch the metal; and those teeth in contact with the metal alone give passage to the electric fluid supplied by a Bunsen pile, and convey it to the small electro-magnets with which they are connected by means of a thin copper wire. These electro-magnets act upon an equal number of small iron rods to keep them out of the way of the wires of the Jacquard, while those teeth which come in contact with the varnish of the pattern are allowed to project against the wires of the Jacquard, to act upon them in the same manner as the cards now used. As a proof of the ease with which new patterns can be applied, when the Emperor and Empress were lately visiting the *Ateliers* to inspect the loom, M. Froment, without interrupting the work, replaced the design in course of execution by a band of tin, on which he had written the words Napoleon III., which were seen to follow on the fabric, the flowers composing the first design.

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*The Oyster Manufacture.**

Although oysters are not exactly spun and woven like cotton, or smelted and rolled like iron, their artificial production has advanced so far as to put the process pretty much in the light of a manufacture. The sowing and breeding of oysters has long been an important branch of our industry; and now the French government has set steadily to work with the matter, on a grand scale, on the coast of France. The place chosen for the experiments in question, is a part of the Bay of St. Brieuc, a spot naturally well situated, and which, for an extent of 12,000 hectares ($2\frac{1}{2}$ acres each,) is very favorable for the breeding of oysters, the bottom being shelly sand, slightly mixed with clay or mud. The tide, which there runs from N. W. to S. W., and from S. W. to N. W., at the rate of about three miles an hour, keeps the water constantly renewed, and carries off all unhealthy deposits, and contracts, by breaking against the rocks on the shore, the necessary vivifying properties. The immersion of the breeding oysters was commenced in March and concluded about the end of April, during which time about 3,000,000 of oysters, taken some from the sea and others from the banks at Cancale and Treguler, were distributed in ten longitudinal beds in different parts of the bay, forming together a superficies of 1000 hectares. The position for these banks had been traced out beforehand on a chart, and floating flags were placed to direct the movement of the vessels engaged in the operation. In order that the immersion of the oysters should be made with perfect regularity, and that the female oysters should not be injured by lying too thickly one over the other, two steamers, towing boats laden with oysters, proceeded from one end of the bank marked out to the other, letting down the oysters as they went, and then, when reaching the other end, turning round and retracing their way, thus distributing the fish with as much regularity

* From the Lond. Practical Mechanic's Journal, May, 1859.

as a plough could turn up a furrow in a field. After having laid down the oysters in conditions most favorable for their multiplication, it was necessary to organize around and over them prompt means for collecting the spawn, and constraining it to fix itself on the spot. One of the plans adopted to accomplish this object was to cover the bottom of the new bed with old oyster shells, so that not a single embryo could fall without finding a solid body to fix itself to. The second plan, as already stated in a former report, was to place long lines of boughs of trees, arranged like fascines, from one extremity of each bed to the other. These fascines were ballasted by a weight placed at the bottom, and the tops of them when fixed in their position, stood about eighteen or twenty inches above the bed of oysters, and thus prevented any of the spawn from being carried away by the current. These fascines were placed by men with diving dresses. As the cords with which the fascines were at first fastened would soon wear out, the report states that they may hereafter be replaced by small chains of galvanized iron, manufactured for the purpose in the arsenals of the State. The most exact indications have been made on the chart of the bay, so that the fascines may be taken up as regularly, in order that the oysters attached to them may be collected, as a farmer could pick the fruit from his trees. The report then goes on to say that, although six months have scarcely elapsed since the operations were performed, the result has exceeded the most sanguine expectations. The banks of Cancale and of Granville, in their most prosperous days, never showed such an amount of production. The fascines have on their branches such clumps of oysters that they resemble trees in an orchard, the boughs of which are in the spring hidden by the exuberance of the blossoms. They may be called real petrefactions. One of those fascines, which had been brought to Paris in order that his Majesty might judge of the effect of the plan, had young oysters on it to the number of 20,000. They are already more than an inch in diameter, and they only occupied in the water the space which would be covered by a sheaf of corn in a field. These oysters, when they have arrived at perfection, will be worth at the current price, at least £16. The bay of St. Brieuc will consequently become a really rich treasury, if other beds similar to those already formed be laid down there.

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*How the Earth is Peopled.**

The Director of the Statistical Bureau of Berlin furnishes the following curious statement:—"The population of the whole earth is estimated to be 1,288,000,000, viz:—Europe, 272,000,000; Asia, 755,000,000; Africa, 200,000,000; America, 59,000,000; and Australia, 2,000,000. The population of Europe is thus subdivided:—Russia contains 62,000,000; the Austrian States, 36,398,620; France, 36,-039,364; Great Britain and Ireland, 27,488,853; Prussia, 17,089,407; Turkey, 18,740,000; Spain 15,518,000; the Two Sicilies, 8,616,922;

* From the Lond. Practical Mechanic's Journal, May, 1859.

Sweden and Norway, 5,072,820; Sardinia, 4,976,034; Belgium, 4,607,-066; Bavaria, 4,547,239; the Netherlands, 3,487,617; Portugal, 3,471,199; the Papal States, 3,100,000; Switzerland, 2,494,500; Denmark, 2,468,648. In Asia, the Chinese Empire contains 400,000,-000; the East Indies, 171,000,000; the Indian Archipelago, 80,000,000; Japan, 35,000,000; Hindostan and Asiatic Turkey, each 15,000,000. In America, the United States are computed to contain 23,191,876; Brazil, 7,677,800; Mexico, 7,661,520. In the several nations of the earth there are 335,000,000 of Christians (of whom 170,000,000 are Papists, 89,000,000 Protestants, and 76,000,000 followers of the Greek Church). The number of Jews amounts to 5,000,000; of these 2,890,750 are in Europe, viz:—1,250,000 in European Russia, 853,304 in Austria, 234,248 in Prussia, 192,176 in other parts of Germany, 62,470 in the Netherlands, 33,953 in Italy, 73,995 in France, 36,000 in Great Britain, and 70,000 in Turkey. The followers of various Asiatic religions are estimated at 600,000,000, Mahomedans at 160,000,000, and "Heathens" (the Gentiles proper), at 200,000,000.

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*On the Practical Bearing of the Theory of Electricity in Submarine Telegraphy, the Electrical Difficulties in Long Circuits, and the Conditions requisite in a Cable to insure rapid and certain communication.** By S. ALFRED VARLEY, Assoc. Inst. C. E.

(Continued from page 138.)

There are only two ways of reducing induction, the one is to increase the thickness of the insulating material, and so render the conditions less favorable for its development, and thus approach the conditions of a suspended circuit, where the induction having to take place through a considerable space of air—a dielectric of very low specific inductive capacity—there is but little accumulation of statical charge, and consequently the impetus is almost entirely directed forward, and scarcely diverted laterally to any appreciable extent.

In gutta percha covered wires, when the insulating material is increased in size, it has been shown that the full effect of the increased thickness is not obtained, owing to the outer surface increasing at the same time.

There is also another quality possessed by resinous substances, and probably by gutta percha, worthy of consideration. It is the property of absorbing a charge in the mass of the substance, instead of its being confined entirely to the surface; the tendency of this will be to still further reduce the advantage of an increased thickness of insulating material.

A reference to first principles will make this clearer.

All bodies insulate to a certain extent, and the only difference between a so-called conductor and insulator that would appear to exist, is a difference of degree, and if a charged body is brought into the neighborhood of an insulated conductor, induction will take place

* From the Jour. of the Society of Arts, No. 332.

through it in the same way as through a dielectric, but owing to the particles of conducting substances possessing the property of readily communicating their forces one to another, the inductive force developed at the further extremity will, within certain limits, be scarcely affected by the length of the conductor through which induction is taking place.

The absorption of a charge within the substance of the dielectric is an approach to this condition, but its practical moment when gutta percha is the insulating substance has to be determined by experiment.

Lessening the induction by reducing the resistance has next to be considered.

The first thing obviously will be to obtain a metal of the highest specific conducting power, for could the sectional area be diminished without increasing the resistance, the induction would be reduced proportionately to the decrease in the surface. The next will be to increase the sectional area of the conductor, and although this involves increased surface, yet there will be a gain; for when the diameter of a wire is enlarged, the surface over which the amount of induction extends does not increase in the same ratio as the sectional area which determines the resistance opposed by a conductor. To make this clearer, let four cables arranged side by side be employed as one conductor.

Such an arrangement will possess four times the sectional area, and oppose only one-fourth the resistance; in other words, the same tension of current will force through four times the dynamic quantity of electricity that would be generated through the single cable when used alone. Signals would not, however, be transmitted more rapidly through the four cables than through the one, for although the conducting power has been increased four times, the surface has been quadrupled also, which will exactly counterbalance the lessened resistance; but merge the four into one, the external inductive surface will then be halved, whilst the sectional area will remain the same as before, and there will be only half the induction manifested.

It therefore follows when a wire is enlarged, that as the sectional area increases as the square, whilst the surface increases only in regular proportionals, the relative balance of forces in favor of rapidity of conduction will, in a submarine conductor of a given size, be twice the amount of that in a wire of half the diameter.

I would now attempt an explanation of how it happened that an actual retardation was observed in some of the experiments with the Atlantic cable when a conductor of enlarged sectional area was employed; and on this head I would again quote from my remarks on a former occasion:—

"In the experiments to ascertain whether any advantage would result from the use of an increased sectional area of metallic conductor, recourse was had to joining the cables side by side, the increased inductive surface with such an arrangement involved having possibly been overlooked. This will account not only for an increased speed not having been obtained, but for an actual retardation having been

noticed. Electro-magnetic induction coils do not create electricity, they simply offer a ready means of converting electricity of a low tension and considerable dynamic quantity into electricity of very high tension and small dynamic quantity. The quantity evolved by them is always smaller in proportion as the intensity is greater. Both cannot readily be obtained together, and if a very high intensity is required, the quantity must be sacrificed, unless the size of the apparatus is immensely increased. This difficulty has evidently been appreciated, as the induction coils used by the Atlantic Telegraph Company are of large size and great length, so as to obtain high tension with an appreciable dynamic quantity. Nevertheless, there is little doubt but that the quantity evolved even by these machines, when compared with that generated from voltaic batteries, is small. This being the case, on giving the current a larger number of channels to rush into, there is not enough electricity to fill the wires, consequently the tension of the current will be very much lowered. The effect of this will be that a longer time will elapse before the tension of the wire will be raised sufficiently high at the further extremity to render itself apparent on the instrument. To obtain, under such conditions, the same speed with four cables as would be obtained with one alone, it would be necessary to employ four of these induction coils, ranged side by side, and worked with four times the battery surface, so as to generate four times the dynamic quantity of electricity. When qualified with these conditions, under which, no doubt, the experiments were tried, the reasoning contained in the Atlantic Telegraph Company's pamphlet, given in an earlier portion of this paper, is correct. It is precisely a case of having four Leyden arrangements to charge instead of one. A telegraph cable is, in fact, a Leyden arrangement, which has to be charged to a certain degree of saturation, before signals are obtained. The degree to which it has to be charged, statically, depends upon the extent of inductive surface compared to the conductibility of the metallic core. In a circuit where the conductibility of the metallic core is very great, compared with the inductive surface of the insulating material, no high degree of statical charge can take place, and signals will pass quickly. The opposite effect will be noticed in a circuit where the inductive surface is very large compared with the conductibility of the metallic core. The wire will then have to be statically charged very highly, before a perceptible current will flow from the further extremity, and signals will be obtained proportionately more slowly."*

The reason why signals are found to pass when magneto-electric induced currents are employed in place of voltaic ones arises, I believe, not from any specific difference between them, but simply from the tension of the induced currents being very much greater than any voltaic ones which have been employed.

On this head I will say nothing further here, but would refer those who may take an interest in it to my paper of a former occasion, where I have fully entered into this subject, and also attempted an explanation of how it has happened that in the experiments with voltaic

* *Vide*, "The Atlantic Telegraph."

currents, of varying intensities, no difference of speed has as yet been observed.

The amount of retardation which will be experienced in submarine circuits possessing conductors of varying resistance, and insulated with different thicknesses of insulating material, it appears to me can, comparatively speaking, be readily determined by actual experiment.

I have for a long time been engaged in designing an apparatus for this purpose, and at the time I arranged to give this paper, I fully expected to have had the apparatus completed by this time, and to have been able to have laid it before you on this occasion; and, though I regret not being able to do this, yet I feel I have sufficiently advanced to warrant my explaining the principles of its construction.

The principles upon which it is based are: that a body which offers the same resistance as another, without reference to its substance or length, may, as far as conducting power is concerned, be considered electrically the same. If we make use of a substance or metal of any inferior specific conducting capacity to that of the metal employed in submarine circuits, and also of greatly diminished sectional area, the same resistance as that offered by the very longest circuits can be obtained in a very small compass; and such an arrangement will, as far as simple conducting power is concerned, fairly represent a long submarine circuit.

The induction which manifests itself in submarine circuits can also be obtained if the conditions for its development are as favorable as they are in submarine conductors.

The apparatus consists 1st, of a series of resistances, the values of which are known.

2d, Of a series of induction plates, the values of which, when compared with a given surface of gutta percha coated wire, are also known.

3d, A mechanical arrangement to accurately measure minute periods of time.

By a combination of these resistances and the induction plates, a conductor, which will fairly represent a submarine circuit, will be obtained.

The resistance can be diminished or increased, and the inductive surface can be doubled or halved at pleasure, and thus circuits with conductors of varying lengths and sectional area, and different thicknesses of insulating material, be imitated, and the law which governs the retardation in the transmission of telegraphic signals determined by direct experiment.

It may be argued that as the inductive surface in a telegraphic circuit is uniformly spread throughout, a series of induction plates will not present the same conditions, but it is evident that they may be divided throughout also, and although they will not then precisely represent what is actually the case, the result will approximate very closely to those obtained from a submarine conductor.

Perhaps it would have been prudent not to have called attention to an apparatus before its completion. I have done so, however, because I have felt it was due from me to endeavor, at least, to point out how

some of the important problems involved in submarine telegraphic communications between distant stations may be resolved.

The chief deductions from what has been brought forward in this paper are :—

1st, That the metallic core of a submarine cable should be composed of a conductor of the highest specific conducting capacity.

2d, That a decrease in the retardation which is caused by the induction that takes place in submarine circuits, can only be obtained by increasing the thickness of the insulating material, or by using a wire of larger dimensions; but that it will be better to do this by enlarging the sectional area of the conductor as much as is practicable.

In designing a cable there are many considerations besides those of its simple electrical qualifications which have to be entertained. The object to be obtained is the best result with the most economical investment of money. Are the proportions which were adopted in the Atlantic cable the best to ensure this?

The weight of the conducting coil in this cable is about 93 lbs. to the mile, the value of which, speaking roughly, would, I suppose, be about as many shillings. When served with gutta percha its value was raised to £40 per mile. The iron sheathing and getting the cable on board brought its value up to £100 per mile. The expenditure, however, did not cease here; there were the hire of ships, salaries of staff, &c., &c. In this cable, therefore, only four per cent. at the outside was invested in the conductor upon which the transmission of the messages depended.

If the views which I have brought forward are correct, a conductor of double the diameter would only possess half the amount of retarding force of one of half the size. Such a conductor, at the very outside, would not cost more than £19 per mile, and the increased expenditure, in serving such a conductor with gutta percha, and giving it an iron sheathing, would not, comparatively speaking, be very large; the expenses of the staff and the hire of ships would be about the same in both cases: the latter would be, perhaps, increased slightly, but not to any material amount.

There are a great many other points which should be entertained in such a paper as this, but the paper has already run out to such a length that I will not trespass any further on your patience; and in conclusion I would only add, that if the ventilation of the subject, through the medium of this communication, should tend in any way to the progress of Electric Telegraphy, the object of its author will have been obtained.*

Discussion.—The CHAIRMAN, in inviting the electricians present to take part in the discussion, would call their attention to the generally scientific character of the paper, although there was a passage towards the close of it which opened up a practical question of great import-

* See excerpt minutes of Proceedings of the Institution of Civil Engineers, Vol. xvi., Session 1856–'57.
See "The Atlantic Telegraph. A History of Preliminary Experimental Proceedings, &c., published by order of the Directors of the Company," pages 20, 23, 25, 26, and 40.
See also the *Engineer* of December and January, 1858–'59. "A discussion on the Induction in Submarine Circuits, by X. Y. Z., G. Blair, M. A., Telegraphic Engineer, and J. Tatlock.

ance. Even if this had not been so, he thought in a society like this, where they dealt generally with the practical application of scientific principles, he would have been justified in inviting gentlemen to enter more particularly into the practical application of the theory which had been so ably brought before them. He would call their attention especially to one view which had been expressed very clearly with regard to the difference which existed between the Leyden jar and a long line of insulated wire with a distant termination connected with the earth. Mr. Varley had put before them what insulation practically was in such a case. It was not the separation of a body in an electrical state entirely from all surrounding substances, but the amount of resistance offered by the long wire before it terminated in the earth. This distinction had been brought before them in a very lucid manner, and he thought they were much indebted to Mr. Varley for having done so. He hoped gentlemen present would give their ideas as to the proportion of metallic conductor that should be used in long lengths of submarine cables, such as that between this country and America; also, as to the mode in which the conducting medium should be constructed—whether of a single or a compound wire. This, however, was not the whole question; they had to consider not only the thickness of the wire and insulator, but also whether the insulating substance—gutta percha—was the best that could be adopted for the purpose, and whether before the next great experiment was tried with an Atlantic cable, they could not obtain further light with respect to the insulating medium that was best adapted to a length of cable of that description, both as to cheapness and the power of resisting the pressure of the water, although he thought cheapness in that part of the conductor was a matter of minor importance. It appeared that the conductor itself was only 4 per cent. of the whole cost of the last great experiment to America. The additional cost of the conducting medium, even to the extent of 8 or 10 per cent., was not to be considered for a moment, but the point was, whether by increasing the dimensions of the conducting medium, they did not at the same time increase the amount of induction. He should be glad to hear the views of Mr. Walker on this subject, as that gentleman's experience would be most valuable.

Mr. C. V. Walker had attended to listen and learn, rather than obtrude his own views upon the meeting, but, being called upon, he would offer a few observations. The difference which Mr. Varley remarked between the Leyden jar and a submarine cable, was that which was generally recognised; it was simply a difference of degree as to the relative states of the inner and outer coating. The cable did practically possess all the distinctive character of the Leyden jar, notwithstanding that the inner and outer coatings were connected, as the experiments made with the Atlantic cable illustrated. The experiments worked out in the early part of the paper to determine the law of induction, would be found very clearly laid down by Sir William Snow Harris in the little book published by Weale. He had shown that the law of induction was inversely as the distance, and directly as the

surface. The next clause of the paper referred to "intensity." This term had led to much confusion; moreover he thought in the present state of electrical science the conditions regarding conduction were far more completely expressed by the formula of Professor Ohm, than by Mr. Varley's diagrams. Another question in connexion with submarine cables was the size of the conducting wires. This was a very important one, and he was quite sure they would think he was possessed of very little modesty if he ventured to give judgment upon a matter which, in his opinion, was so entirely a question of experiment that he only wondered the great cable was laid down before this important point had been satisfactorily investigated, so as to put the matter beyond the possibility of question, whether that conducting strand of seven wires was too large or too small. An opportunity occurred to him to try some experiments with seven or eight distinct miles of insulated wires of different sizes and different thicknesses of gutta percha insulation. The wires were in lengths of about one mile each, and the results of those experiments were decidedly in favor of a small wire as the conducting medium. There were many points in connexion with small wires worthy of consideration, one of which was cheapness, because, although the per centage of saving upon a mile of wire was small, yet the saving would be very great in a cable to extend across the Atlantic. The smaller the wire was the greater the insulating power obtained from the same amount of gutta percha. The alleged advantage of the smaller wire was, that there was a greater resistance in the circuit: but, in the pamphlet published by the Atlantic Telegraph Company, the experiments made by Mr. Reid were described, from which it appeared that he sent a signal through 1000 miles of cable with a battery of two plates only, excited by his tongue, so that the resistance to be overcome by that small battery could not have been great. Another point was the return wire, and upon that he considered the whole question of the Atlantic cable turned. What helped them on the one hand hindered them on the other. The effects of the magnetic disturbances of the earth would be obviated by a return wire. If two lines of cable were laid down, and the current passed to Newfoundland by one wire and returned by the other, this inconvenience would be got rid of, but they would have the other inconveniences which Mr. Varley had laid before them. If the two wires formed portions of the same cable they would cause a greater amount of retardation, because one wire would polarize the other. But if two wires were used in the same cable in a somewhat different fashion, namely, if one was laid as the centre wire, and the other carried spirally round it, and the current divided between the two wires, the polarization would be very much reduced, if not entirely annihilated. Those two wires, however, would act externally upon the outer coating, which would render the advantage nugatory. In his opinion the next Atlantic cable would not be coated with an iron jacket, as the former one had been; but a coating of hemp and other non-conducting materials would be employed. It might be interesting to the meeting to know the time

it actually took to send signals through the Atlantic cable. By Whitehouse's induction coil it took $1\frac{3}{4}$ seconds, whilst the battery current was 6 seconds in its passage through, at least as far as he recollected.

Professor TYNDALL said that the paper displayed a considerable amount of research, and an extensive acquaintance with the ordinarily accepted laws of electricity, as well as with the phenomena of retardation and induction. He would express the feeling that beset him, as he heard the paper read; and he spoke with all frankness and all respect to Mr. Varley and those who, like him, were engaged in these researches, when he said that knowledge such as had been displayed in this paper, ought to be somewhat like the manure that was applied to agricultural purposes: it ought to be put under ground, and new fruits ought to sprout from it. He had been looking intently for the results of this knowledge which had been brought before them; some of it was interesting, but for the most part, it did not deal with facts, but rather with conjecture, more or less ingenious. The whole subject involved a complicated problem. There was not a shadow of doubt that each element of it could, by proper experiment, be separated from the rest, and its due influence described with certainty; and this was what ought to be done, instead of speculating upon the laws of electricity. He thought those speculations ought to be the private property of the man who worked the subject; they ought to guide him in his searches after facts; and if he produced the facts, he could then show the connection there was between the facts and the first principles of the science. He would refer more particularly to what he should himself like to see done. He had heard remarks about thickening the wire and the surrounding insulation. He would ask had any particular experiments been made to ascertain the law of, or the benefit to be derived from, thickening the wire? Had experiments been made to determine the law by which retardation was diminished, when the thickness of the gutta percha coating was increased? They could take the absolute wires that were to be used, and cover them with gutta percha and india rubber, and compare them, and they could tell with certainty which was the best insulator. They could tell the influence of the thickness of the wire, and the thickness of the insulator; and he thought their knowledge of the principles of electricity ought to be the guiding light to carry their minds to the determination of these cardinal points.

(To be Continued.)

Artificial Wood.

In one of his last lectures at the "*Conservatoire des Arts et Metiers,*" M. Payen called the attention of his hearers to the process of making a kind of ebony or artificial wood, very hard, very heavy, and capable of receiving a very high polish and a brilliant varnish. M. Ladry, the inventor of this process, takes very fine saw-dust, mixes it with blood from the slaughter-houses, and submits the resulting paste to a very

heavy pressure obtained by the hydraulic press. If the paste has been enclosed in moulds it will take the form of the mould, and resembles pieces of ebony carved by a skilful hand.

Another curious application of this paste consists in the formation of brushes; the bristles are arranged in the paste while yet soft; the paste is covered by a plate pierced with holes, through which the bristles pass; the pressure is then applied, and brushes are obtained, made of a single piece, cheaper and more lasting than the usual kind. This artificial wood of M. Ladry is much heavier than common woods.—*Cosmos.*

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*Alloy of Steel.**

Experiments have been made at Vienna, Dresden, and other places, in the use of tungsten or wolfram in the alloying of steel, and some extraordinary results are stated to have been achieved. It is said that steel alloyed with 20 per cent. of tungsten produces a mixture, which, while it retains all the general qualities of steel, is so excessively hard that tools made of it will cut, without difficulty, the hardest cast steel. Large quantities of the new alloyed metal are said to be in preparation, and a company is about to be formed to work the discovery.

Uniform Musical Diapason.†

Very considerable inconvenience has long been felt in the musical world in consequence of the want of a uniform standard by which the pitch of musical instruments, whether used individually or in concert, might be regulated. The tendency in all the most celebrated orchestras to an increased elevation of pitch has been attended by evils which affect the interests of music in no small degree. Composers, instrument-makers, and artists are alike sufferers from this cause, and the great difference existing between the pitches (or diapasons, as they are called,) of various countries, or of various musical establishments, is frequently a fertile source of embarrassment in musical transactions. With a view to remedy this acknowledged and growing evil, the French government some time ago appointed a commission of distinguished men to discuss and collect information upon the whole question; and the result of their labors has lately appeared in the *Moniteur*, in the shape of a very elaborate and interesting report.‡

The commission consisted of fourteen members, all of them eminent in the world of music or science, as the following enumeration of their names will show:—Pelletier (Secretary-General in the Ministry of State, President), Halévy, Auber, Berlioz, Despretz (Professor of Physics at the Faculty of Science), Camille Doucet (Ministerial Head of the Theatrical Department), Lissajous (Professor of Physics at the

* From the Lond. Mechanics' Mag., April, 1859. † From the Lond. Jour. of the Soc. of Arts, No. 339.

‡ Rapport présenté à son Excellence le Ministre d'Etat par la Commission chargée d'établir en France un Diapason Musical Uniforme.

Lycée St. Louis, and Member of the Council of the Society for the Encouragement of Works of National Industry), General Mellinet (Superintendent of the Bands of the Army), Meyerbeer, Monnais (Imperial Commissary at the Lyrical Theatre, and at the Conservatoire), Rossini, and Ambroise Thomas. Any opinions emanating from a body of men so well qualified to judge upon a subject of this nature, must necessarily be worthy of attention; and we think, therefore, that a short summary of their report may not be uninteresting to the musical portion of our readers.

The report commences by stating that it is an undoubted fact that the diapason or pitch, has been steadily rising for at least a hundred years, and that it is now quite a whole tone higher than it was in the middle of the last century. As a proof of this, we have the internal evidence of the scores of Gluck, Monsigny, Grétry, and others, besides the more certain testimony of the organs of the time. Rousseau (*Dictionnaire de la Musique*, article *Ton*,) states that the pitch of the opera in his time was lower than that of the chapel, and consequently more than a tone lower than that of the opera of the present day. The first question, then, that naturally presents itself for consideration is, what were the causes which have led to this result? Vocalists cannot fairly be charged with any participation in producing this change. They screamed, it seems, even in those days, without the facilities afforded them by the operas of Signor Verdi. Besides, it is manifestly never for the interest of the singer that the diapason should be forced up—a circumstance which can only tend to increase his fatigue and make inroads upon his voice. The interests, too, of composers are, for many reasons, opposed to an undue elevation of the pitch. They have, moreover, but little power of influencing an orchestra in this respect. The composer does not fix the diapason—he submits to it. It is, then, says the report, to the instrumentalists and the instrument-makers that this result must be attributed. They are the persons who have evidently a joint interest in raising the diapason of the orchestra. Up to a certain point, the more elevated the pitch the greater the brilliancy and sonority of an instrument.

The numerous inventions and improvements which have been effected in wind instruments have more than anything induced the unnatural height which the diapason has now reached. A direct confirmation of this is afforded in a particular instance by a letter addressed to the commission by M. Kittl, the director of the conservatory at Prague, who states that the Emperor Alexander I., upon becoming proprietor of an Austrian regiment, ordered new instruments to be made for the band. The manufacturer, in order to increase the brilliancy of tone, raised the pitch considerably. This having produced the desired effect, the example was followed by other military bands, who all raised their diapason.

With the view of obtaining as much valuable information as possible upon the subject, which is one of universal interest to musical art, the commission wrote to all the most celebrated musical centres in England, Belgium, Holland, Italy, and America. Almost all the answers

which they received agree in their estimation of the importance of the subject, and in deprecating the undue height of the diapasons now in use. Some of these communications, coming as they do from composers and conductors of the first eminence, are very interesting. It would, however, occupy more space than we can afford, to attempt any thing more than a very brief mention of one or two of the most striking. Reissiger writes from Dresden that he hopes all Europe will warmly applaud the establishment of the commission. The great elevation of the pitch, in his opinion, destroys the effect and effaces the character of ancient music—of the master-pieces of Mozart, Gluck, and Beethoven. Ferdinand David, Franz Abt, and Lachner, express with equal decision their approval of the step which the French government has taken. Herr Wieprecht, the director of the military music of Prussia, and Dr. Furke, each forwarded able papers upon the subject, and manifested a lively sympathy with the objects which the commission had in view. From several quarters tuning forks, to the number of twenty-five, were received. Of these Messrs. Broadwood sent three, which afford a striking example of the necessity which exists in our own country for some re-adjustment and assimilation of the pitches now in use. The first is a quarter of a tone lower than that of Paris, and is used exclusively for piano-fortes destined to be employed for the accompaniments at vocal concerts. This, it seems, was the pitch used about thirty years ago by the Philharmonic Society. The second, which is higher than the Paris pitch, is that to which Messrs. Broadwood ordinarily tune their instruments, as being most likely in general to be in tune with harmoniums, flutes, &c. It is the diapason of instrumentalists. The third, still higher, is that now used by the Philharmonic Society, and, with one exception—viz: that employed in the band of the Belgium regiment of guides—is the highest which the commission received. This latter vibrates nine hundred and eleven times in a second, whereas the No. 1 of the Messrs. Broadwood, the lowest of all the tuning forks sent in, gives only eight hundred and sixty-eight vibrations in the same time. This difference is nearly equivalent to a semitone.

With these and various other similar communications before them, the commissioners unanimously came to the conclusion that it was desirable—first, that the diapason should be lowered; and, secondly, that when so lowered, it should be taken as an invariable regulator. The determination of the particular diapason to be adopted naturally presented considerable difficulties, and accordingly led to some diversity of opinion. All agreed that a depression of more than a semitone was neither practicable nor necessary. One member alone advocated a depression of less than a quarter of a tone. He, indeed, proposed that the alteration should at the most extend to half a quarter of a tone—fearing that any greater change, coming suddenly into operation, might act prejudicially upon the trade in musical instruments, which is one of the most successful branches of French industry. It is difficult, however, to see much force in this objection, when we consider the great variety which exists in the diapasons already in use

throughout Europe. In a letter addressed to the Minister of State by the principal French instrument-makers, they enlarge upon the embarrassment resulting "from the continually increasing elevation of the diapason, and from the variety of diapasons," and go on to request his Excellency "to put an end to this kind of anarchy, and to render to the musical world a service as important as that rendered to the industrial world by the creation of a uniform system of measures." It is evident from this that the manufacturers themselves do not regard with apprehension the contemplated change of diapason.

Ultimately, a depression of a quarter of a tone was fixed upon. This, it was thought, would afford an appreciable relief to vocalists; and, "without introducing too great a derangement in established habits, insinuate itself, so to speak, *incognito* into the presence of the public. It would render the execution of the ancient master-pieces more easy; it would lead us back to the diapason employed (in Paris) about thirty years ago—the period of the production of works which have, for the most part, retained their places in the repertory, and which would accordingly be restored to the original condition of their composition and representation. It would also be more likely to be accepted in other countries than the depression of half a tone." In accordance with the recommendations of the commission, an official order has been issued, establishing by law a uniform pitch to be used by all the musical establishments of France which have any connexion with the government. This "normal diapason" is an A, given by a standard tuning-fork to be preserved at the Conservatoire, which vibrates 870 times in a second, All musical establishments authorized by the state must be provided with a tuning-fork, verified and officially stamped as consonant with this standard. These regulations come into force on the 1st of July next for Paris, and on the 1st of December for the departments.

Such are the energetic steps which the French government has taken in a question which, in our own country, would probably be thought far too trivial to call for state interference of any kind. It would, moreover, in all probability, be almost impossible for us to effect any analogous reformation in the musical world by means of official legislation, inasmuch as we have—and we regret that it is so—scarcely any musical establishments which are dependent for their support upon the government, or which can in any way be said to have a national character. Much, however, might be done by private combination. If such men as Professor Bennett, Mr. Costa, Mr. Benedict, Mr. Alfred Mellon, and Messrs. Broadwood could, upon consultation among themselves and with others of our more eminent musicians and instrument-makers, come to some understanding upon this question, and would offer their suggestions to the world, it would not improbably lead to a reform which, as we have before remarked, is even more pressingly called for in our own country than in France, where the movement has originated. It would, at any rate, be satisfactory to know the opinion of the men who, in England, are best qualified to speak authoritatively upon the subject.

*Gun-making at Woolwich Arsenal.**

Of the innumerable experiments tried during the last two years at Woolwich Arsenal for the purpose of ascertaining the best way to make large guns, *one* good thing has come, at all events—the authorities and ourselves know the proper kinds of iron to use for the purpose. Failures there may have been in the subsequent stages of manipulation, but many guns were certainly cast of the best possible admixture of metal for the purpose. So long back as 1856 iron-masters and others were invited by public advertisement to send to that establishment samples of the iron they could confidently recommend for this particular branch of manufacture. Fifty samples came on this invitation. These were subjected to tests chemical and mechanical in the first instance, and selections were made from them. The result of these primary experiments demonstrated what has subsequently been completely confirmed—that English cold blast pig iron is quite equal in purity and strength to the bulk of foreign iron. Northerton and Parkhead were found in these early trials, indeed, to be far superior to East Indian or Nova Scotian. Swedish grey occasionally proved of very superior character, but generally it seemed extremely hard, and it could not be used, therefore, safely in the composition of guns. The impurities sought for in the chemical testing of the iron were silicon, sulphur, and phosphorus, and if these existed in quantities larger than 1·5 per cent. of the first; ·05 of the second; or ·5 of the third, the iron was uniformly registered. The mechanical tests were applied to ascertain the tensile and transverse strength of the material when cast into bars. Its specific gravity was also taken into account. Without going further into detail, however, upon this interesting subject at present, it may be stated—and there is some satisfaction, in a patriotic sense, in doing so—that the irons peculiarly adapted by nature for the manufacture of large guns are English, and these stand in the following order:—Northerton and Parkhead, Staffordshire; Bowling, Yorkshire; and Blaenavon, Shropshire. The cost of these averages from £6 to £6 10s. per ton, against £8 15s. to £10 per ton for foreign. The charge of metal necessary for the casting of a 68-pound gun, with the "dead heads"—the latter is used, however, in the charge for the next gun to be cast—is 8 tons or thereabouts, and the conveniency of using English irons, with the certainty that they are the best, becomes thus apparent. Whether the Arsenal will yet be able to *finish* these weapons in a style equal to that of certain contractors is, we believe, a problem yet to be solved.

Manufacture of Horn by Rolling.†

M. Possoz, of Ixelles, Belgium, has lately suggested the adoption of a combined softening and rolling process for working up horn into various articles and shapes. As a primary treatment, the horn is sub-

*From the Lond. Mechanics' Magazine, April, 1859.
†From the Lond. Practical Mechanics' Magazine, April, 1859.

jected to the action of a hot bath, being kept at a constant temperature by a jet of steam at a pressure of sixty or seventy pounds. In this way, the very heart of the horn is penetrated, and the material is rendered fit for undergoing the rolling or laminating process. When withdrawn from the baths, the pieces of horn are forced on to conical mandrils, for the purpose of straightening them. In this condition the horns remain until sufficiently hardened, when they are taken off the mandrils and split longitudinally into two halves, either by a circular rasp or by a cutter. The horns are again placed in the hot bath for a second softening, and afterwards in a cylindrical wrought iron vessel, formed with a double bottom and filled with oil, into which a jet of steam is introduced. This vessel is worked under a high steam pressure as in the former case, and the horn is now rendered supple and soft and fit for the rolling operation. The "grain" of horn always runs straight, that is to say, the fibres are parallel to each other in the length of the individual horns; and consequently, when rolled, these fibres are all lengthened and compressed, and thus the material preserves its elasticity and solidity. When umbrella and parasol ribs are to be made, this rolling system affords peculiar facilities for the purpose; the whole process, in fact, does for horn what has been so well accomplished for iron.

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*Large Specimens of Titanium.**

At the Manchester Literary and Philosophical Society, Mr. Wm. Brockbank exhibited some large specimens of titanium, which have recently been found in considerable quantities, filling the crevices and under the hearths of the fire-brick linings of the furnaces of the Hematite Iron Company, of Whitehaven. In one instance it occurred in a large mass weighing nearly 4 cwts., under the furnace hearth, having found its way through the crevices between the fire-bricks. Smaller masses, weighing from 50 lbs. or 60 lbs. to a few ounces, were found filling the hollows and crevices in the lining of the furnace, around that part which holds the molten metal. The occurrence of titanium in such large quantities is a new and interesting circumstance, previous instances being confined to a few furnaces in South Wales (where hematite ore is used as a mixture), and to some in the Hartz mountains, in both of which cases the specimens found were comparatively small. Small crystals of it have long been found in the slags of many iron works. Should any commercial use be discovered for titanium, it could be supplied in considerable quantities.

* From the Lond. Mining Journal, No. 1227.

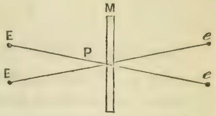
For the Journal of the Franklin Institute.

Experiment in Binocular Vision, elucidating the Principle of the Stereoscope.

A familiar experiment in binocular vision elucidating the principle of the stereoscope, and one which I have never seen alluded to, is

obtained by looking into a mirror and concentrating the ocular axes upon any spot on the surface of the glass, of an equal elevation with the eyes. If no such spot exists it can readily be supplied by wetting a piece of paper or wafer the size of a pea.

The reflected images of the eyes being as far behind the glass as the eyes are before it, and equidistant from each other, the ocular axes concentrated upon the surface of the mirror will, if produced, cross and precisely meet them, producing in the centre of the forehead one large cyclopian eye.



Referring to the figure, let M be a mirror, E E the eyes, *e e* their images, P a piece of paper upon which the eyes are concentrated.

The ocular axes crossing at P, combines the images, *e e*, into one eye, which will appear in the middle of the nose at that point. W.

Germantown, Penna.

*Expectation of Life at any Age from Five to Sixty Years.**

Every man, woman, and child has a property in Life. What is the value of this property? Mr. Charles M. Willich has established an extremely easy rule for expressing this value—this "*Expectation of Life*" at any age from five to sixty. His formula stands thus: $e = \frac{2}{3}(80 - a)$; or in plain words, the expectation of life is equal to two-thirds of the difference between the age of the party and eighty. Thus, say a man is now twenty years old. Between that age and eighty there are sixty years. Two-thirds of sixty are forty:—and this is the sum of his expectation of life. If a man be now sixty years he will have an expectation of life nearly fourteen years more. By the same rule, a child of five has a lien on life for fifty years. Every one can apply the rule to his own age. Mr. Willich's hypothesis may be as easily remembered as that by De Moivre in the last century, which has now become obsolete, from the greater accuracy of mortality tables. The results obtained by the new law correspond very closely with those from Dr. Farr's English Life Table, constructed with great care from an immense mass of returns.

A Simple Means of Demonstrating the Working of Liquid Fire-shells.†

The bi-sulphide of carbon is first poured into the shell, and then small bits of phosphorus are dropped in; the mouth of the shell is then closed with a cork, partly projecting, like the cork in a wine-bottle. The shell may then be laid on canvass, or other combustible matter; and in about ten minutes, the fermentation of the mixture will force its way through the pores of the cork, and, meeting the

* From the Lond. Athenæum, Feb., 1859.
† From the Lond. Mechanics' Magazine, April, 1859.

oxygen of the atmosphere, will become ignited; the cork acting like the wick of a candle, and the liquor underneath feeding it. A leaden shell thus charged, and adapted to the Lancaster military rifle, will continue to burn for ten minutes with an intense flame which cannot be extinguished by water.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, August 18, 1859.

John C. Cresson, President, in the chair.

John Agnew Vice-President. } Present.
Isaac B. Garrigues, Recording Secretary. }

The minutes of the last meeting were read and approved.

Letters were read from the Royal Society of London; the Commissioners of Public Schools, Baltimore, Maryland; and the American Oriental Society, New Haven, Connecticut.

Donations to the Library were received from the Royal Society, and the Royal Astronomical Society of London; the Smithsonian Institution, and Lieut. M. F. Maury, U. S. Navy, Washington, D. C.; the Regents of the University of the State of New York, Albany, N. Y., and the Mutual Life Insurance Co., City of New York; the American Oriental Society, New Haven, Connecticut; the Maryland Institute, Baltimore, Maryland; Dr. Charles M. Wetherill, Lafayette, Indiana; and from Charles E. Smith, Esq., and J. J. Barclay, Esq., Philada.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement of the receipts and payments for the month of July was read.

The Board of Managers and Standing Committees reported their minutes.

Candidates for membership in the Institute (5) were proposed, and the candidates (8) proposed at the last meeting were duly elected.

Two tubes taken from the Pirsson's fresh-water condenser of the steamer *Keystone State*, were laid upon the exhibition table, for the inspection of the members. Six months ago, after a use of several months, many of the original tubes were found to be much injured by the action of sea water; owing to an impure copper having been used in their manufacture. The builders of the *Keystone's* machinery determined to coat the new tube with either zinc or tin, giving zinc the preference, on account of its superior conducting power, though more subject to the chemical action of sea water. However, some of the tubes were coated with tin, and the balance with zinc; and were put into the condenser side by side. The tube heads were of copper, and the external casing of cast iron. A tube of each sort was placed before the meeting. The one coated with tin was perfect as when first put in, with the tin still remaining; whilst that coated with zinc was much corroded, particularly near the ends where it approached the tube heads;

and the heads themselves were eaten away at the places of contact. Thus, the coating of tin seems to be the best preservative of the tubes, and as no falling off of the vacuum took place from the lower conducting power of that metal, another example is brought forth to prove the statements made by Mr. Pirsson in regard to his condenser. (See *Jour. Frank. Inst.*, vol. xxxvi., 3d Series, page 234.)

COMMITTEE ON SCIENCE AND THE ARTS.

Report on J. W. Fawkes' Steam Plough.

The Committee on Science and the Arts constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination "a Steam Plough," invented by J. W. Fawkes, of Christiana, Lancaster Co., Pennsylvania,

Report:—That they have examined the machine and witnessed its operation in the field.

The plan of construction appears to be as simple as the case admits. A pair of horizontal engines connected on one shaft by cranks at right angles, propel the machine over the ground, by means of a double gearing, which reduce the velocity of the driving-wheel to one-sixth that of the cranks. The steam cylinders are 9 inches in diameter, and 15 inches length of stroke.

The driving-wheel is a strong drum, six feet in diameter, and six feet long; the large surface of which enables it to run on soft ground. The steering wheels are $3\frac{1}{2}$ feet diameter and 15 inches wide, and are placed 54 inches distant apart.

The axle on which they are placed is guided by a steering wheel geared into a tangent screw.

The ploughs, eight in number, are suspended by chains from a framed outrigger projecting in the rear of the machine, and can be raised entirely out of the ground, by chains working over small barrels, which can at will be connected to the engine by sliding clutches.

The arrangement of the ploughs is such as to allow them to follow in a regular succession at the proper lateral distance for the furrow.

When working at a speed of about three miles an hour, the eight furrows were turned with great ease and completeness. The work was not as smooth as to satisfy a Pennsylvania ploughman, owing to the form of the ploughs, which is such as is said to be preferred for breaking up prairie land, for which this machine is especially designed. It appears to be capable of breaking up land at the rate of three or four acres per hour.

In the opinion of the Committee, its great simplicity of plan and efficiency in working, entitle it to strong commendation, and make it worthy of the Scott's Legacy Medal, the award of which is accordingly recommended.

By order of the Committee,

Philadelphia, August 9, 1859. Wm. Hamilton, *Actuary.*

Abstract of Meteorological Observations for June, 1859; *made in Philadelphia, Somerset, Dauphin, and Centre Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.*

1859.	PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.									SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.						HARRISBURG, Dauphin Co. 40° 16′, N. 76° 15′, W. JOHN HEISELY, M. D., Obs.				FLEMING, Centre Co. Lat. 40° 55′ N. 77° 53′ W. Ht. 780 ft. S. BRUGGER, Obs.		
	Barometer.		Thermometer.			Relative humidity.	Force of vapor.	Rain.	Prevail'g winds.	Bar.	Ther.	Relative humidity.	Force of vapor.	Rain.	Prevail'g winds.	Bar.	Ther.	Rain.	Prevail'g winds.	Ther.	Rain.	Prevailing winds.
June.	Mean.	Mean daily range.	Mean.	Daily oscillation.	Mean daily range.	2 P. M.	2 P. M.			Mean.	Mean.	2 P. M.	2 P. M.			Mean.	Mean			Mean.		
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	Direc.	Inch.	°	Per ct.	Inch.	Inch.	Direc.	Inch.	°	Inch.	Direc.	°	Inch.	Direc.
● 1	29·982	·060	68·0	13	4·2	76	·617	0·800	S S E.	27·734	69·3	65	·625		(var.)	29·845	71·7	1·423	S W.	69·3		(var.)
2	29·908	·075	76.5	20	8·5	57	·689		S S W.	27·702	69·3	69	·664		(var)	29·768	77·3		S W.	75·7	0·500	N W.
3	29·744	·164	72·5	14	4·0	74	·757	0·839	S S W.	27·652	63·7	56	·483		W.	29·647	76·7		W.	68·0		N W.
4	29·898	·154	56·3	14	16·2	53	·282		N W.	27·779	42·7	68	·204		N W.	29·855	55·7		N W.	46·7		N W.
5	30·011	·113	57·0	21	6·7	37	·215		N W.	27·826	47·0	52	·242		N W.	29·928	58·3		N W.	52·0		N W.
6	30·037	·050	68·4	20	7·8	38	·295		(var.)	27·832	56·7	45	·312		(var.)	29·985	65·3		S W.	63·0		S E.
☽ 7	30·086	·050	65·7	24	2·2	29	·255		S W.	27·783	62·7	52	·469		S W.	29·964	68·0		S W.	65·7		(var.)
8	29·798	·288	72·7	20	7·0	64	·600		S S W.	27·611	64·3	81	·509	0·496	W S W.	29·665	71·3	0·089	S W.	67·0	0·345	W.
9	29·835	·136	66·5	16	6·2	37	·278		N W.	27·674	59·7	61	·448		(var.)	29·752	67·7		N W.	62·0		S W.
10	29·804	·065	67·8	25	7·0	49	·533	0·348	S W.	27 654	56·0	80	·436	0·313	W.			0·080	(var.)	56·3	0·100	N W.
11	30·072	·268	58·0	20	10·2	37	·215		N W.	27·849	48·7	56	·311		(var.)	30.026	58·3		N W.	57·0		(var.)
12	30 109	·037	63·2	24	5·2	42	·315		S W.	27·803	61·7	52	·469		S E.	30·000	63·3		S.	60·3		S W.
13	29·969	·140	69·7	24	6·5	76	·641	0·108	S S W.	27·720	66·3	68	614	0·508	(var.)			0·590	(var.)	65·3	0·335	W.
14	29·858	·111	77·7	10½	8·0	79	·890	0·377	S W.	27·737	70·7	71	·671	0·065	(var.)	29·798	78·0		S W.	72·0		W.
○ 15	29·760	·098	82·3	22	4·7	53	·750		S W.	27·644	73·3	63	·662	0·258	S W.	29·662	79·7		S W.	76·3	0·120	S W.
16	29·694	·067	79·7	14	2·7	55	·704	0·138	S W.	27·568	67·0	62	·525		W.	29·577	78·3		S W.	67·3		W.
17	29.623	·076	63·8	16	12·5	92	·556	1·475,	N N E.	27·461	61·3	75	·529	0·180	(var.)	29·528	66·3	0·608	(var.)	61·3	0·420	E.
18	29·710	·105	69·2	20	5·3	45	·369		(var.)	27·571	59·0	52	·339		N W.	29·637	70·3		N W.	57·0		N W.
19	29·851	·141	71 3	23	2·2	38	·354	0·278	S W.	27·662	57·7	91	·429	0·376	(var.)	29·774	67·7		W.	63 0		(var.)
20	29·704	·147	66·8	11	5·2	84	·577	0·403	S W.	27·510	68·0	82	·785	0·175	W S W.	29·565	75·0	0·078	S.	74·0	0·500	S W.
21	29·541	·163	75·3	22	8·5	64	·717		S S W.	27·443	67·3	43	·429		W.	29·456	76·7	0·578	W.	68·3		W.
22	29·635	·094	73·7	14	1·7	65	·650		W N W	27·544	63·7	52	·469		(var.)	29·574	76·0		W.	67·7		W.
☾ 23	29 829	·195	70·7	15¾	3·0	67	·619		(var.)	27 665	61·7	59	·423	0·865	N E.	29·742	77·0		W.	62·7		(var.)
24	29·856	·027	68·0	9½	3·3	85	·621	0·025	(var.)	27·672	64·0	73	·522	0·398	N N W.	29·776	72·7		E.	69·3	0·680	(var.)
25				16½					(var.)	27·741	61·3	61	·448		(var.)	29·786	77·0		N W.	73·0	0·430	(var.)
26	29·972		80·0	23		45	·525		S W.	27·800	72·0	54	·648		N W.	29·882	77·0		W.	70·3		S W.
27	30·038	·066	76·2	24½	1·5	40	·484		S W.	27·805	75·0	61	·761		(var.)	29·930	79·3		S W.	74·7		S E.
28	29·993	·045	79·2	26½	3·7	69	·881		S W.	27·808	77·7	64	·774		(var.)	29·885	81·7	0·810	S.	79·3		S W.
29	29 812	·181	84·8	25½	5·7	59	·964	0·438	S W.	27·737	76·3	59	·808	0·230	W.	29·732	85·3	0·040	S W.	82·3	0·490	(var.)
● 30	29·828	·145	73·7	17½	11·2	37	·335		N W.	27·760	63·7	63	·531		N W.	29·780	76·3		N W.	65·7		N W.
Means	29·861	·116	70·8	19	6·1	57	·541	5·229	s71°w.	27·691	63·6	63	·518	3·864		29·768	72·4	4·296		66·4	3·915	

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

OCTOBER, 1859.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Steam and its Condensation. By THOMAS PROSSER, C. E.

(Continued from page 80.)

CHAPTER VIII—PART II.

The second part of my subject—the surface required for the condensation of steam—was not determined by the *experiments*, further than the previously recorded fact, that it was greatly exceeded in the apparatus used; it amounted to 47 superficial feet, or nearly half the boiler water-heating surface. I have no doubt that, with thin steel, instead of iron tubes, one-fifth will be found sufficient. The foundation of this belief is to be found in the fact that, when the condensing water was at 55° F., the steam water* was frequently below 100° F., instead of being about 200° F., which is the ordinary temperature.

If the steam-water can be forced into the boiler at this latter temperature, the heater-condenser may be dispensed with; but, to insure the action of the feed pump, it appears desirable that the water in the reservoir be at a temperature of some 20° to 30° F. below that of the superincumbent steam, for the purpose of insuring solid water.

* I beg leave to be allowed the use of the following terms for the sake of brevity, and to avoid repetitions:

Steam-water	for condensed steam or water of condensation.
Pistonage	for the steam space displacement of the piston.
Clearance	for the space at each end of the cylinder beyond the piston range.
Passages	for the steam passage from the cut-off to the cylinder.
Leakage	for the steam leakage by the piston and exhaust port.
Total Power	for the mechanical power developed by converting one pound of water from the boiling point into steam.—See this *Journal*, vol. xxxvi. (3d Series), p. 7.

Still it may be a question whether, on board a ship, it is worth the space occupied; *I* believe it will always be found so, as the space over the distilling condenser can seldom be appropriated to any other purpose; and, moreover, the apparatus appears not liable to the least deterioration, or to give the slightest trouble, so far. In fact the whole condenser and boiler may claim the same immunity; for, after eighteen months in one case, and more than two years in another, of constant use, not the slightest trouble or difficulty of any kind has occurred.

One-tenth part of the boiler water-heating surface will be sufficient for the heater-condenser, and the same for the still-condenser, of a sea-going steamer requiring distilled water for the use of the ship.

These questions, however, have not been determined experimentally, on account of the want of steam to test the power of the condenser, and therefore some modification may be found desirable hereafter; but the paramount consideration, *the supply of distilled water to recuperate the waste from the boiler*, is placed beyond a doubt, even if that waste, including as it does all the steam condensed in the cylinder, be three times the amount which we know it has not exceeded. It may surprise many to be told what the amount of this waste of boiler water really is. In the "*Fulton*" and "*Arago*" I have the best authority for stating it to be 25 per cent., for their surface condensers would supply but three out of the four boilers with fresh water, even when the boilers and condensers were comparatively new.

Of the "*San Jacinto*" with her old copper boilers "in good condition,"* and not two years old, and with new condensers, it was said, "The condensers *performed well*, furnishing *more* than enough fresh water for two out of the three boilers."† I quote the exact words which will some day be read with astonishment. If this is "*performing well*," it makes rather an interesting inquiry of what performing bad means.

How much more than two-thirds of the steam was returned to the boiler as fresh water, we are not informed, but presume it was not three-fourths. In fact these expensive boilers were a wreck in four years afterwards,‡ having been in commission but five and a half altogether.

This waste of water is almost entirely from the boiler. The steam-water from condensation in the cylinder is too valuable to be thrown away, and as to superheating the steam sufficiently to prevent it, that is impossible, without incurring the greatest danger and encountering difficulties as great if not greater than that to be overcome.

The first part of this chapter closed with showing an evaporation equivalent to 12 pounds of water with 1 pound of coal. Of that 12 pounds of water, however, I claim but 10 pounds as *bona-fide steam*, after it had left the cylinder *and entered the condenser*. It does not follow, however, that the remaining 2 pounds were wasted, and therefore have to be restored to the boiler, for the half of that had its equivalent in superheat of the steam, and therefore we have only actually to provide for the other half, or about 8·2 per cent., which, as before

* Jour. of Franklin Inst., vol. 28 (3d Series), p. 128.

† Ibid, p. 130. ‡ Ibid, vol. 38 (3d Series), p. 8.

stated, was the real deficiency of every kind and from every source, a deficiency which is less than *one-third* the ability of the distilling condenser to make good.

CHAPTER VIII—PART III.

Having disposed of the equivalent of one pound of water converted into steam, as superheat in the whole body of the steam generated, and of one pound of water which disappears, whether as water or as steam, we come to that of the ten pounds of *pure steam* as I contend the remainder to be. If not *pure steam*, the test to which I shall submit it will soon discover it, and, at the same time, fully test the accuracy of the forthcoming Report of the Board of Inquisition, for that in its most objectionable form is its character.

Personally, I have the greatest respect for the individual members of that board, and for the faithful and able manner in which the experiments were conducted. But the objectionable part of the proceedings is (in accordance no doubt with red tape precedents and official dignity) that the Report, instead of being submitted to the person supposed to be *individually* more particularly and understandingly interested therein than any other, is "*hid from his sight*," and sent off to one who is not necessarily supposed to know or to care anything about it; so that if there are any damning errors in the Report, they are discovered too late to be amended, and "*Ruin*" may sign as one of the board. Is it too much to imagine that a Board composed of U. S. Marine Engineers may fail to appreciate at its true value, an invention necessarily new, unknown and untried, which upsets the whole theory in which they have been educated, and sacrilegiously tears away the air-pump from the shrine in which its idolizers have placed it? Had there been discussion in open court on all debatable subjects, surely the Report could not have suffered in efficacy from that cause, and I should have no need to lay this anchor to windward. As I do not intend to leave anything to mere imagination, I have carefully measured the cubical contents of the steam engine, for the purpose of ascertaining the amount of steam, that is to say of the ten pounds which is effective, premising that, excepting the salvage of the exhaust steam, all which is used in clearance and passages is *lost*, whether working with or without expansion, provided the calculation be made at the end of the stroke.

The cut-off does not entirely regulate the expansion, but it is the whole steam which passes it up to the period of cutting off, and which of course includes not only the due portion of the pistonage, but also that of the whole of the clearances and passages.

In the case in question the steam was cut off at 5·076 in. of the 18 in. stroke, or as 1 to 3·5461, but the real steam expansion is as 1 to 2·778527. The former represents, at the moment the steam is cut off, the proportion which the pistonage then bears to the whole pistonage, viz: as .2909757 ft. to 1·0318288 cubic feet, while the other represents the proportion which the whole steam which has passed the

cut-off valve at the same moment, bears to the whole capacity of the cylinder, clearances and passages combined, viz: as ·4165543 ft. to 1·157407 cub. ft.

Without expansion the "*abstract* practical value" of the steam which it is the object of this portion of our paper to elucidate, is reduced by three causes. First, the clearance and passages; second, the leakage; and third, the back pressure of the steam upon the piston.

	Cub. in.		Cub. ft.
The Pistonage per double stroke is . .	1783	=	1·0318288
" " clearance, and passages,* .	87	=	·0503472
Totals,	1870	=	1·0821760

The steam engine made 21,600 double strokes (in 8 hours) with 2565 lbs. of steam, that being the weight of steam-water actually caught.

It was found upon trial with the fly-wheel of the engine scotched, that, about five per cent. was lost by leakage. We have therefore to account for ninety-five per cent., or 2436·75 lbs. of the steam-water, as having been working steam, and therefore

$9{\cdot}5927 = \left(\frac{1{\cdot}0821760,21600}{2436{\cdot}75}\right)$ cubic feet of such working steam weighs 1 lb., corresponding with 45·5 lbs. per square inch of pressure, and 135° C. of temperature.

Steam at this pressure has a total power equal to lifting 1 lb. 62·916 feet, but only $\cdot953477 = \left(\frac{1{\cdot}0318288}{1{\cdot}0821760}\right)$ of it is available.

The back pressure upon the piston was 16 lbs. per square inch, which leaves an unbalanced steam pressure of 29·5 = (45·5—16) lbs. per square inch; so that even of the working steam, only $\cdot648352 = \left(\frac{29{\cdot}5}{45{\cdot}5}\right)$ is available in *work done*, or of the whole working steam effective in work done ·618188 = (·953477×·648352). Taking the whole 10 lbs. of steam which entered the cylinder, only ·5872786 was available in *work done*. Hence we have H. P. $11{\cdot}1966 = \left(\frac{\cdot5872786,62,916}{33,000}\right)$ from the evaporation of 10 lbs. of water with 1 lb. of coal per minute. This is but ·893122 lbs. of water per minute per H. P.

The coal was therefore 5·35873 lbs. per hour per H. P., and, as the coal used was 32 lbs. per hour, the power developed was (32÷5·35873) =5·97156 H. P.

In order to show the extravagance in fuel by using steam of so low a pressure, we will calculate the known certain effects of applying the steam at 160 lbs. pressure per square inch, with the same back pressure as before, viz: 16 lbs. to the square inch.

We have available as before ·953477, and hence

H. P. $17{\cdot}4115 = \left(\frac{\cdot953477,\ \frac{144}{160},\ \cdot95,\ 70,481}{33,000}\right)$ The total power at this pressure is equal to lifting 1 lb. 70·481 feet, ·95 of which is available

* There is a salvage from this in the exhaust steam, which I have not thought worth deducting.

as before. Now, 17·4115 H. P. by the evaporation of 10 lbs. of water with 1 lb. of coal, is ·57433 lbs. of water per minute per H. P.

The coal 3·446 lbs. per hour per H. P.; and, as that is calculated as before at 32 lbs. per hour, the power developed is $(32 \div 3{\cdot}446) = 9{\cdot}2861$ H. P., or more than 50 per cent. of increase, by merely increasing the pressure of the steam, which pressure is perfectly safe, as any competent person will declare, after an examination of the boiler.

Comparative Analytical Development of Power by the Two Pressures.

Full pressure of the working steam per sq. in. in lbs.,	45·5	160
Unbalanced pressure of the working steam "	29·5	144
Loss by cylinder leakage, . . .	·50	·50
" " passages and clearances, .	·44	·44
" back pressure upon piston, . .	3·19	·91
Available in *work done*, . . .	5·87	9 13254
		10·98254
Gain in total power, by increase of pressure, .		·98254
Total cost,	10.	10.

I must now close this chapter, reserving for another the consideration of expanded steam, which is of sufficient importance to claim one to itself.

(To be Continued.)

*Simple Method of Calculating Earthwork.**

To the Editor of the Civ. Eng. and Arch. Journal.

In your May number, A. S. W. describes a method of calculating the contents of cuttings, and asks if it has ever been previously used. I may inform you that the same method has been used by me for some years, but I never looked upon my application of it as a *discovery*, for I thought it would be sufficiently obvious to any person with a slight knowledge of mathematics, who might have frequent occasion to measure irregular solids.

The method was first suggested to me in 1846, when investigating the proper system of ascertaining the cubic contents of walls built to

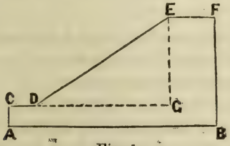


Fig. 1.


Fig. 2.

support the slopes of embankments. I was then engaged in forming reservoirs at Whittle Dean, for the water supply of Newcastle-upon-Tyne. The walls of our grating tanks were of the form shown in the two figures: Fig. 1 being an elevation of the wall, and Fig. 2 a section of the same at E.

* From the London Civ. Eng. and Arch. Jour., July, 1859.

The upper surface of the walls, or where they coincided with the slope of the embankment, as on C, D, E, F, was of uniform breadth, the face was perpendicular, and the back battering. In measuring the contents of the triangular portion D, E, G, it seemed at the first glance that a near approximation would be attained by multiplying the length D G, by half the height E G, and this again by an average thickness found by taking one-third of the sum of the thicknesses at the angles. I soon found that not an approximation only, but the exact contents was the result. Subsequent investigation showed me that this method was coincident with, and directly deducible from, the prismoidal formula.—For let us call a, b, and c, the thickness at D, E, and G respectively, l = the length D G; h = the height E G.

For wider application I take a different symbol for the thickness at each angle. Then "*the sum of the areas of the ends added to four times the area of the middle section, and multiplied by one-sixth of the length will give the contents.*"

Area at D $= a \times o = o$. Area at E G$= \dfrac{b+c}{2}\, h$.

Four times area of middle section $= 4 \times \frac{1}{2}\left(\dfrac{a+b}{2} + \dfrac{a+c}{2}\right)\dfrac{h}{2} = \left(a + \dfrac{b+c}{2}\right)h$

Content $= \left[\, o + \left(a + \dfrac{b+c}{2}\right)h + \dfrac{b+c}{2}\; h\,\right] \times \dfrac{l}{o} = \dfrac{a+b+c}{3} \times \dfrac{l\,h}{2}$

which last expression is the method of A. S. W.

The prismoidal formula admits of very wide application, and I find it useful in calculating the contents not only of cuttings, but of conic and pyramidal frustrums, and in various ways.

Hexham, May 10, 1859. T. D. RIDLEY.

The applicability of the prismoidal formula to cones, wedges, spheres, &c., is shown by Mr. Ellwood Morris, Civ. Eng., of Philadelphia, in the *Journal of the Franklin Institute*, vol. xxiii, page 241, year 1852. The application to embankments and excavations, the measurements of masonry, &c., has been general on our public works from the date of their commencement. *Ed. Jour. Fr. Inst.*

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*On the Relative Values of Coke and Coal in Locomotive Engines.**
By BENJAMIN FOTHERGILL.

(Continued from page 154.)

Mr. JOHN BRAITHWAITE, having been called upon by the Chairman, said that having the intention at some future time to bring forward some views of his own in reference to combustion, he must decline entering fully upon the subject that evening. He had listened with attention to the remarks of the last speaker, and there were several of his views which, in the paper that he hoped to be allowed to bring before the Society at a future period, he should endeavor to controvert. Whether it was a question of using coal or coke, he believed

* From the Jour. of the Society of Arts, No. 339.

the present arrangement of furnaces and the manner of producing combustion were very far behind what he hoped would ultimately be arrived at. He thought that, ere long, the boilers of engines would be constructed of a different form, so as to produce more efficiently the draft in the furnace, not precisely after the plan which he (Mr. Braithwaite) brought forward in 1829, but such an improvement upon it that the combustion would be steadily carried on and the gases essential to the generation of steam would be given out without the use of the diffuser to which allusion had been made. This principle had been carried out in the caloric engine, and had been found, so far, successful.

The CHAIRMAN was gratified to hear that it was Mr. Braithwaite's desire to give them the benefits of his practical experience in these matters.

Mr. BRAITHWAITE would be glad to do so, and for that reason he would not then forestall any thing he had to say.

Mr. JOHN BETHELL, being called upon by the Chairman, said he did not feel himself competent to say much upon this point, because the paper was chiefly directed to locomotive engines, of which he had had little or no experience. He might, however, make an observation with reference to the general question as to the comparative merits of coal and coke. He confessed he did not think the paper had sufficiently entered into it. Some years ago it was stated at the scientific institutions, that the coke made from a certain quantity of coal would give the same amount of heat, and evaporate just as much water, as the coal from which it was made. He believed that was a theory which was advocated in that room some years ago, by his friend, Mr. George Lowe. He (Mr. Bethell) confessed he was astonished at that theory, for when they observed the great heat that was generated in converting coal into coke, it seemed very remarkable that the coke should, after being subjected to that process, give as much heat as the coal itself. He had burned many thousand tons of fuel in the stationary engines of his manufactories, and after some consideration of the subject it was clear to him that the difference arose entirely in the mode of burning the fuel. It was possible, no doubt, to construct a furnace which would give coal no advantage over coke. The real point was, the proper construction of the furnace. It was excessively simple to burn coke when operated upon by a strong draft, so as to get all the heat out of the carbon which it contained; but it was not so simple to burn coal, because this involved two operations; they had to burn the gases, which required one mode of treatment, and the carbon, or coke, which required another mode of treatment. He confessed he had not yet seen any plan which, in his opinion, was perfect for carrying out his ideas of burning all the gas and all the carbon. The plan laid before them that evening appeared to him very complicated. In France and Belgium, where they burnt a great deal of coal, as well as a patented fuel which contained more gas than coal, they had a simple apparatus for doing it, and they carried out the process in the locomotive engines without producing so much smoke

as he had met with on railways in this country. He would not then describe it in detail, but it was a simple arrangement of the fire-box, which allowed air to pass in over the fire. He had hoped the paper would have gone more into the general question, and not have been confined to one description of locomotive. There were many locomotives as well as fixed boilers working in this country, in which various plans were adopted, by which the gas from coal was more or less burnt, though not always efficiently. With regard to the analyses before them, he confessed he was astonished at them, and he could hardly believe them to be correct. It was easy to take an analysis of the composition of coal, but the ascertaining how much water a certain fuel would evaporate was a different matter, as apparatus specially adapted to the different kinds of fuel was necessary in order to obtain reliable results. If they were using an apparatus to burn coal which contained the gases as well as the carbon, they must have an apparatus in which the air came over the fire, and if the same apparatus was used for burning coke it would not answer. Hence they found it stated in the table before them that 1 ℔. of Ramsay's coal evaporated 15 ℔s. of water, whereas 1 ℔. of coke evaporated only 12 ℔s. of water. He believed if the coke were used with a proper apparatus it would evaporate more. Again, they found it stated that the Merthyr coal, which contained 89 per cent. of carbon and 4 per cent. of hydrogen, or 93 per cent. of heat-giving properties, evaporated only 14 ℔s. of water per pound of coal, whilst Ramsay's coal, which contained only 90 per cent. of heat-giving properties, evaporated 15 ℔s. of water. That, to a theoretical man, seemed an absurdity, and showed that in all experiments as to using fuel for the evaporation of water, everything depended upon the manner in which the fuel was used. The Welsh coal owners had, for a long time, contended that their coal would evaporate a larger quantity of water than the Newcastle coal; latterly, however, the Newcastle gentlemen had asserted that their coal would evaporate more water than the Welsh coal; but, to his mind, such statements ought to have no weight unless each description of coal was used with an apparatus especially suited for it. Then came the question, whether the apparatus which was suitable for any particular description of coal could be practically adapted for general use with steam boilers. That was a matter which they all knew to be one of considerable difficulty. They could easily construct a small experimental apparatus, but they might not be able to apply it when coal was burnt in masses for heating large boilers. He did not think the meeting was in a condition to argue this question upon the data given in the paper before them, or to enter into it in a way that its great importance deserved.

Mr. George Lowe, F.R.S., said, although he was not a locomotive engineer, yet he had been connected with the combustion of coal and coke in London for the last thirty years. He agreed with Mr. Bethell that there were anomalies in the tables before them, which were most perplexing. Some of those anomalies had been already referred to, and in one instance it was evident that there was some

mistake, viz: in the statement that there was more sulphur in coke after it had undergone the carbonizing process than in the coal itself. As gas men they knew that when the gas was evolved from the coal a certain amount of lime was wanted to get rid of the sulphur which came out of the coal during the process; and therefore he thought there must be some error in the analyses before them. The point, however, to which he most desired to address himself was with reference to a statement which Mr. Bethell had noticed as having been made by him (Mr. Lowe) on the occasion of the reading of a paper upon this subject by Mr. Apsley Pellatt when he had the honor of occupying the chair. On that occasion he begged to state he gave the general opinions of the books—of the schools—rather than his own. They all looked up to Mr. Apsley Pellatt as a tolerably good chemist and a close reasoner, and that gentleman's experiments upon the relative value of coal and coke for the purposes of his immense manufactory had been of the most beautiful and satisfactory kind. Mr. Apsley Pellatt would work one week or a fortnight with coal and the next with coke made from the same amount of coal, and he had shown that in every instance the work in his manufactory was done as well with the coke produced from a ton of coal as with the coal itself. There were eminent French chemists who confirmed Mr. Pellatt's views, which were further confirmed by some experiments made at Philadelphia; and it was to be remarked that whilst Mr. Apsley Pellatt was working upon a large scale, the French chemists on small scale in a laboratory, and the Americans on another scale, and he (Mr. Lowe) was also making his own experiments, the results of all these trials seemed entirely to coincide. He would now say a word or two upon the best mode of conducting the combustion both of coal and coke. The English locomotive had done great credit to the skill of our engineers, as was proved by the fact that as much as 10 lbs. of water was evaporated with 1 lb. of coal; and there was every hope that much higher results would eventually be obtained. Some of the experiments recorded by Mr. Fothergill were made as far back as 1855; but the French engineers, during the last two years, had made immense progress in the successful introduction of coal into the locomotive engine. After all, the great thing was how to conduct the combustion so as to make use of all the heat-giving properties contained in 1 lb. of coal. Mr. Bethell had, no doubt, hit the point in stating, that it was absolutely necessary that a certain amount of air should go over the fire, as well as through the furnace, to produce the proper combustion of coal. Very little air was wanted to go over the furnace if they used coke, but if they used coal, then a certain amount of atmospheric air must go over the furnace so as to combine with, and promote the combustion of, the hydro-carbons and other inflammable matters, which, if they got so far as the chimney, went off in smoke and were lost. The great object was to prevent smoke and produce heat. Many years ago his (Mr. Lowe's) father conducted one of the largest malting establishments in the country, and the whole of the heat in the kilns was produced by the bituminous coal of Derbyshire. All the products of combustion went through the kiln, and if any

smoke had been produced, five minutes would have sufficed to destroy a very large quantity of malt. For the last thirty-five years there had not been a furnace erected by him, in any part of the world, from Lima to Calcutta, in which the principle of letting a certain amount of atmospheric air pass over the surface had not been adopted. Mr. Lowe directed attention to a model of a furnace designed by him, in 1828, which had remained in Berlin for many years, and in which this principle was shown. He concluded by expressing a hope that Mr. Fothergill would, at some future time, favor them with a further paper upon this important subject.

Professor JOHN WILSON, F. R. S. E., would refer to the comments of Mr. Bethell, in which that gentleman challenged the correctness of the analyses given in Mr. Fothergill's tables. He apprehended that Mr. Bethell imagined these to be practical results, but he (Professor Wilson) believed them to be merely theoretical calculations, based upon the possible evaporating power of coal depending on the quantity of carbon and hydrogen it contained. In No. 1 of the tables, the amount of carbon and hydrogen contained in the coal was 90 per cent., and in No. 3 the amount of those elements was 93 per cent., and yet the combustion of the latter gave a smaller amount of evaporating power than the lesser proportion of carbon and hydrogen in No. 1. If Mr. Bethell would bear in mind the vast difference between the power of hydrogen and the power of carbon to generate heat, he would readily be able to reconcile the difference in the results obtained in the two cases, which depended on the atomic proportions in which these two substances combined with oxygen. He thought, therefore, the surplus of carbon in the second case would be more than sufficient to account for the difference between the quantity of water evaporated by the two qualities of coal respectively. This brought him to a point mentioned in Mr. Clarke's letter, in which that gentleman spoke of the difference between coal which was suitable for locomotive engines and that from which coke was made. He stated that the bituminous coals were not those best suited for these engines. If his (Professor Wilson's) idea was right, as to the value of fuel depending upon the amount of hydro-carbons it contained, then the more highly bituminous the coal was the greater would be its evaporative power. Therefore, if they burnt coal they ought to get that which contained the largest amount of bituminous matter, in preference to that from Wales known as steam coal. Having defended Mr. Fothergill's analyses so far, he would now begin to challenge them himself. There was one point which struck him as rather curious. He could reconcile the difference in the relative quantities of sulphur in coal and coke, for when, as had been stated, it took $1\frac{1}{2}$ tons of coal to make a ton of coke, it was possible that an extra amount of sulphur might exist in the coke; but he could not understand how coal containing 2 per cent. of ash, could be converted into coke containing 7 per cent. of ash when only $1\frac{1}{2}$ parts of coal went to make one part of coke. He took great interest in the question of the introduction of coal into the locomotive engine, and he should hail any contri-

vance that would enable the locomotive to consume coal with the same amount of comfort to the public as they now had with coke.

Mr. BETHELL thought he might have been misunderstood in his remarks in reference to the experiments on the relative heating powers of coal and coke. The point he desired to lay stress upon was, that he could not understand and he could not believe, that if proper apparatus had been used for burning the coke, the evaporative power would have been so small in comparison with that produced by coal.

Mr. CHARLES GREAVES, on being called upon by the Chairman, said he did not feel himself to be well informed upon the bearing of this question as to locomotives, and the paper being specially applied to locomotives, it was only in reference to the burning of fuel in that manner that it was open to much criticism. For his own part, in comparing the efficiency of coal and coke in stationary boilers, and with every contrivance for husbanding the heat, he had found coke had produced greater efficiency than coal. He had tried every method for raising coal to the full efficiency of coke by weight, but he had not been able to do so by any process for the admission of atmospheric air. He had taken part in the discussion of Mr. Apsley Pellatt's previous paper about two years ago, and his further experience confirmed the opinion he then expressed, that the superiority of coke over coal by weight was from 12 to 14 per cent. In point of price, however, coke in London was 60 per cent. dearer than coal; there was, therefore, room for a considerable superiority in efficiency by weight of coke over coal, while still leaving a large economy in money in favor of the latter. There was one point about which he should like to hear a little more, that was as to the theory of the coke cutting the tubes of the boiler, for if that were the case what became of the coke? Did it go up the chimney and blow away as solid coke? This point had yet to be determined.

After some remarks from Mr. DUNCAN in reference to the analyses given in the paper,

Mr. FOTHERGILL, in reply upon the discussion, said he had been entirely misapprehended by one or two gentlemen in reference to the analyses he had given. These analyses had been made in the laboratory of Mr. Dugald Campbell, and were not the result of actual experiment from the use of fuel in a locomotive engine. With regard to the statement of one or two of his friends that he had not brought the general subject fully before the meeting, he begged to state that these gentlemen had overlooked the object of this paper, which he had brought before the Society in fulfilment of a pledge he had given to communicate the results of experiments in which he was engaged as to the comparative merits of coal and coke as applied to the engine which was the invention of Mr. Beattie. That being the case, it would have been, he considered, quite out of place to have introduced more modern experiments, in order to confirm the results obtained at that period. With regard to the question of heating the feed-water referred to by Mr. Clarke in his letter, he would state that when experiments were first made with Mr. Beattie's engine that contrivance was not

appended to it. The apparatus then used did not enable them to feed the boiler with hot water at starting, but as they proceeded on the journey the temperature of the water became higher; but in the modern contrivance they could commence the journey with the feed-water at a high temperature. With regard to the relative quantities of the fuel, he had stated that $1\frac{1}{2}$ tons of coal had been used to produce 1 ton of coke; in some instances the quantity had been $1\frac{3}{4}$ tons of coal to produce 1 ton of coke; but, in order that there might be no misunderstanding upon that point, he had put the calculation into the money shape, and he had stated what the result was without taking into consideration how much coal it required to produce a ton of coke, but had at once given the cost of working the train, which he thought was the legitimate question to which they should turn their attention. He took the coal furnished at a given price, and also the coke, and then instituted a comparison between the two, not troubling himself about the different classes of coal and coke. He had conducted experiments for the Lancashire and Yorkshire, and the East Lancashire Railway Companies, but there was not time to apply the contrivance for heating the feed-water. With regard to the blast-pipe in Mr. Beattie's engines, they had to increase the amount of air to soften the blast, for if they had a powerful blast, they then got an over-heated smoke-box. He never knew an instance of that upon the South Western line but once, which was during a heavy wind, when they had a powerful blast, and the whole of the steam was used in passing up the chimney. The remainder of the questions discussed he believed had been satisfactorily answered in the paper itself, and he begged to thank the meeting for the attention with which they had listened to him.

The Chairman said they had heard a most interesting paper, and discussion upon it. After all that had been said on either side, they must come to the practical question—whether the use of coal or coke was the most economical, as well as the best mode of working a locomotive. He had not gathered that the accuracy of Mr. Fothergill's tables, in respect of the comparative economy of the two systems, had been impugned. Experiments with the engines at the same speed, and for the same distances, had been tried, and the result was as Mr. Fothergill had stated; and unless any one was prepared to impugn that statement, the case must be considered as so far made out. Mr. D. K. Clarke had made a most important statement. He had said that, supposing Mr. Fothergill's experiments to have been clearly made out, there would be a saving of 1 per cent. upon the aggregate railway dividends throughout the country, or no less than £300,000 per annum upon the railway capital of 300 millions. He thought the meeting was very much indebted to Mr. Fothergill for his simple, clear, and able statement of a very difficult and interesting question, and he hoped at some future period that gentleman would be induced to give them some further information upon the subject. He was sure the Society would unanimously pass a vote of thanks to Mr. Fothergill for his very interesting paper.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED FROM JULY 12, TO AUGUST 9, 1859, (INCLUSIVE,) WITH EXEMPLIFICATIONS.

JULY 12.

102. MODE OF STAYING PILES FOR WHARVES, PIERS, &c.; E. H. Angamar, New Orleans, Louisiana.

Claim—In combination with the piles, the frames, the sleeves, and the braces, arranged as set forth.

103. LOCKS; S. T. Bacon, Boston, Massachusetts.

Claim—The construction of one or more pistons or drivers, or both; also, one or more holes in the rotating tumbler or surrounding cylinder, or both, as specified.

104. BANK AND SAFE LOCKS; S. T. Bacon, Boston, Massachusetts.

Claim—1st, Arresting and holding the tumbler in an exact locked position. 2d, Preventing the displacement of the tumbler in the direction of unlocking by means of pins, in combination with the sliding bottom key-hole guard and the tenons. 3d, Preventing the displacement of the tumbler at and beyond the locked position, by means of the slotted collar, in combination with the cylinder, the tumbler, and the tumbler pin. 4th, Preventing the displacement of the tumbler inwardly, by means of the collar, in combination with the cylinder and the bolt of the lock. 5th, Enlarging the piston holes throughout the lock. 6th, Enlarging the holes in both tumbler and cylinder, in each direction from the dividing line between them. 7th, Constructing the key-hole guard of two or more pieces of metal hardened. 8th, Making one or more chambers between the several parts of the key-hole guard. 9th, Dividing the air chamber or chambers with one or more narrow ridges.

105. LAMPS; Joseph M. Batchelor, Foxcroft, Maine.

Claim—The arrangement and combination of an adjustable tube with the wick, button spindle, spur wheels, and friction spring, or the equivalents thereof.

[The stem of the button spindle has arranged on it in connexion with the small spur wheel usually employed for raising the wick, a larger spur wheel gearing into a rack projecting from the side of the wick tube, so that the wick and tube can both be raised or lowered by turning the bottom spindle in exact relative distances to produce the proper amount of light required.]

106. DEVICES FOR TRAINING PEA VINES; John T. Bever, Haynesville, Missouri.

Claim—The posts, when forming a box, as described, and combined with cords, rope, and pegs.

107. RAILROAD CHAIRS; D. E. Bishop, City of New York.

Claim—The formation of a bridle in the centre of the continuous lift of a railroad chair, as described.

108. GRAIN SEPARATORS; J. L. Booth, Cuyahoga Falls, Ohio.

Claim—The box, provided with an inclined bottom or flooring and adjustable strips or valves, arranged to operate as set forth.

[This invention relates to an auxiliary device to be applied to grain separators that separate grain by projecting it against the air, and is more especially designed to be used in connexion with a grain separator that was patented by this inventor, March 8, 1859. In this machine the sound grain is separated from the light and inferior grain, in consequence of projecting it by certain mechanism forcibly against the air; the sound grain, by its superior gravity, being projected further than the light. The object of the present invention is to receive the grain, both the sound and light portions, as it is projected from the machine, and to more fully separate and to collect it into distinct parts, and to graduate the separation as may be required.]

109. RAT-TRAPS; J. Borton, Middlebourne, Ohio.

Claim—The combination of the spring doors, rods, o o, dog, d, and rod, r, arranged in the manner set forth.

110. COMBINATION OF FLESH FORK AND SKIMMER; Charles B. Bristol, Nagatuck, Connecticut.

Claim—The combination of the fork and skimmer, constructed as described.

111. MODE OF OPERATING FARM GATES; J. H. Butler and P. G. Van Houten, Cohocton, New York.

Claim—Actuating the traps by means of the weight and cord, arranged in combination with the lever, or its equivalent, for operating automatic gates, in the manner described. Also, the construction and operation of the double-acting latch, in combination with an automatic gate for carriages.

112. WALKING CANES; Ansel Cain, Holyoke, Massachusetts.

Claim—The combination of the lamp, arranged in the manner described, with the walking cane.

113. HANGING THE BODIES OF VEHICLES; J. H. Case, Lyons, New York.

Claim—The combination of the metallic springs with thorough braces, in the manner set forth. Also, the combination and arrangement of the combined thorough braces with the circular body and supplementary spring, as described.

114. SKIRT SUPPORTERS; Matthew Chambers, City of New York.

Claim—Combining with and securing to a corset band extending in the rear, or in the rear and front downwards from the waist, to clasp the body around the hips of the wearer, the framework of a skirt or bustle, when said frame-work is composed of hoops disconnected and fastened in front, or thereabouts, as described.

115. MODE OF TELEGRAPHING FROM RAILROAD CARS WHILE MOVING; Denison Chesebro, Syracuse, New York.

Claim—The combination of a sufficient number of pendants, arranged as described, and each having a movable vertical tongue, and so constructed as to admit of a telegraph wire being attached to each of them in the particular manner specified, with the metallic plates, wood scantling, or equivalent, and conducting internal wires, attached to the roof of a railroad car.

116. DEVICE FOR FASTENING CUTTERS OF HOLLOW AUGERS; Wm. A. Clark, Bethany, Connecticut.

Claim—The angle wedge, in combination with the cutters, face plate, screws, and ledges, as described.

117. Fruit Basket; David Cook, New Haven, Connecticut.

Claim—Making a metal bound wooden fruit basket, either plain or ornamental, when constructed and fitted for use, as described.

118. Connecting the Ends of Railway Bars; John Davis, New Bedford, Massachusetts.

Claim—1st, Connecting the rails of railroads in continuous chains with hinge joints, in any practical mode. 2d, Securing the rails in the couplings, by inserting wedges longitudinally under the rails, and clinching their margins. 3d, Wedge, D2, to secure wedge, D3, and vice versa, by means of the hinge joint or bolt.

119. Wheels of Buggy Boats; Perry Davis, Providence, Rhode Island.

Claim—Arranging paddles upon the spokes of the wheels of a buggy boat, so that the wheels perform the two-fold purpose of paddle-wheels and carriage wheels, in the manner set forth.

120. Revolving Fire Arms; W. C. Ellis and J. N. White, Springfield, Massachusetts.

Claim—The projection at the bottom of the chambers of the cylinders, on which the fulminate of the cartridge rests, and is struck by the hammer in the discharge. Also, the flanch of the cartridge parallel with the barrel, the two in combination, for the purpose specified.

121. Apparatus for Tanning; L. C. England, Oswego, New York.

Claim—In combination with the leach-vat and the conveyer trough, the pair of rollers to crack the wet bark before it is delivered into the leach vat.

122. Fireman's Ladder; Daniel Fitzgerald, City of New York.

Claim—1st, Suspending a ladder upon a standard, so that it may be elevated and turned in any direction. 2d, The arrangement of the branch pipes with the stop-cocks for use at various heights. 3d, Making the main pipe serve as a hand-rail to the ladder, and to give it stiffness, by setting it up a little above and parallel to it, as described.

123. Method of Hanging Pictures, Looking-glasses, &c.; W. A. Foster, Chester, Connecticut.

Claim—Adjusting picture frames or mirrors to different positions and at different angles, by means of a central hinge and levers, as described.

124. Breech-loading Fire Arms; M. J. Gallagher and Wm. H. Gladding, Savannah, Georgia.

Claim—Forming the chamber in the barrel and breech of the gun of the shape of two frustrums of cones, or of a frustrum of a cone, and a section of a parabolic spindle, whose bases meet at or near the line of the joint between said barrel and breech, for the purpose of containing a cartridge case of the form as represented.

125. Clothes Frame; Joseph Gasser, Toledo, Ohio.

Claim—The arrangement of the braces and arms in connexion with the standard and legs, as set forth.

126. Dumping Car; David Glover, Cass Township, Pennsylvania.

Claim—The construction of a revolving tip placed upon a movable frame or truck, the side pieces of which form, at a certain stage of the operation, a continuation of the main track or foundation, by means of which the wagon or car can be taken, without handling, from the main track or foundation, with the load moved to the place required, and there dumped in any direction.

127. Shingle Machine; Freeman Godfrey, Grand Rapids, Michigan.

Claim—The cams, gearing into rack bars attached one to each end of the carriage, said cams being fitted in a yielding or adjustable centre-poised frame, and operated from the power lever, through the medium of the pawl, ratchet, and gearing.

128. Machine for Making Paper Bags; Wm. Goodale, Clinton, Massachusetts.

Claim—1st, Making the cutter which cuts the paper from the roll or piece of the form herein described, that, in cutting off the paper, it also cuts it to the required form to fold into a bag without further cutting out. 2d, The attachment of the former directly to the cutter to operate in combination therewith, and with a folding table. 3d, The described mode of applying and arranging the paster, to operate in combination with the folding table and the former. 4th, The construction of the side lappers with angular ends, for the purpose of partly folding the sides of the bag. 5th, The knock-off, operating in combination with the former. 6th, The vibrating frame with its rollers, operating in combination with the former and the knock-off, as described. 7th, The arrangement of the table, the cutter, the former, the side lappers, the bottom paster, the knock-off, and the vibrating frame, to operate in relation to and in combination with each other.

129. Machine for Splitting Fire-wood; Darwin A. Green, City of New York, Administrator of Elias Davis, deceased.

Claim—The slabbing knife and splitting knives secured to one cross-head, acting simultaneously at the forward movement of the latter, as described.

130. Dry Gas Metres; Tobias Grodjinski, City of New York.

Claim—Attaching each pair of the plates, or their equivalents, to the flexible part of the diaphragms of dry gas metres, by overlapping parts of the one upon the other, in the manner set forth.

131. Sewing Machines; George Hensel, City of New York.

Claim—The construction of the disc with an elastic plate attached, and operated by means of a cam, in the manner set forth.

132. Stoves; S. Emilius Hewes, Albany, New York.

Claim—A revolving fire-pot, arranged to traverse perpendicularly or to be raised and lowered, as described, for the purpose of supplying air to, and shutting it from, the openings in the sides of the fire-pot, so as to effect a ready and perfect combustion and consumption of the fuel.

133. Clothes Frame; H. J. Holmes, Warren, Massachusetts.

Claim—A series of vertical frames, one of which has permanently affixed to it a foot-piece and cap, when said cap and foot piece forms suitable bearings for other frames, arranged as set forth.

134. Water-wheels; John P. Hughes, Spout Spring, Virginia.

Claim—Making the water arms in sections, essentially as described.

135. Dumping Wagon; Anthony Iske, Lancaster, Pennsylvania.

Claim—The drop-door with its lever, the partitioned box with its rack bar on the bottom, the handled spindle for moving the same, as specified.

136. MACHINES FOT DRESSING MILL-STONES; John W. Kennedy and John F. Plummer, Plainfield, Connecticut.

Claim—The arrangement and combination of the arbor, forked arm, spring, shaft, U, ratchet and pawl, wiper, bar, movable case, shaft, K, and adjustable plate, as described.

137. HEAD-BLOCK FOR SAW-MILLS; J. Kurtzeman, Lancaster, Pennsylvania.

Claim—The sliding rack bar placed longitudinally in the carriage, and adjusted therein by the wedges in connexion with the gearing, whereby the two sides may, by a suitable adjustment of the wedges, be actuated both simultaneously and separately, as may be desired.

138. METHOD OF CONSTRUCTING MALLETS; Wm. Lance, Olney, Illinois.

Claim—The manner of their construction and arrangement, as described.

139. BEE-HIVES; John K. Leedy, Woodstock, Virginia.

Claim—1st, The boxes, constructed and arranged in the manner specified. 2d, In combination with the boxes, the pipes, and their faucets, all arranged in the manner set forth.

140. SALIMOMETER; Robert H. Long, Philadelphia, Pennsylvania.

Claim—The means of drawing into a vessel water from a steam boiler as a means to facilitate testing the density of the water in the same, constructed and arranged as set forth.

141. LIFE-PRESERVING RAFT; A. G. Mack, Rochester, New York.

Claim—Surrounding a cask or chamber with conical floats arranged radially with said chamber and hinged thereto, and covering the cone with canvass, or other suitable material, and bracing the whole together by a rope, suitably arranged.

142. PAINT CANS, &c.; John Masury, Brooklyn, New York.

Claim—The construction of a metallic can for hermetically sealing paints and other substances, having attached thereto a rim or ring of thin brass, or other soft metal, in such a manner that the top or cover may be removed by severing the said rim or ring of brass, or other soft metal, with a penknife or other sharp instrument, in the manner described.

143. EARTH-BORING AUGERS; A. A. McMahen, Oxford, Mississippi.

Claim—Bracing the two ends of the spiral portion of the auger by means of the central rod, in the manner described. Also, the manner of securing the boring tools and rod to the spiral, by which they may be removed and replaced without making any changes on the spiral, in the manner described.

144. DREDGING MACHINE; Anton Menge, Point a la Hache, Louisiana.

Claim—1st, The bucket frame, when resting upon adjustable casters or friction rollers, and operated so as to be swung from right to left of the boat upon a circular track, in combination with the oscillating shaft, all arranged in the manner set forth. 2d, The buckets having a hinged back, arranged as specified.

145. PRESERVE CANS; F. O. More, Bellefontaine, Ohio.

Claim—The peculiarly formed cap, in combination with the curved spring lip.

146. PORTABLE OVEN; Z. N. Morrel, Cameron, Texas.

Claim—Forming the pin on the handle on the cover of a Dutch oven or skillet, in combination with the tube under the centre of the frying-pan or gridiron.

147. DYNAMOMETER; Charles Neer, Albany, New York.

Claim—The combination of the rigid arm or arms and yielding incline or inclines with the loose pulley, or its equivalent, whereby the power exerted to rotate the shaft is denoted by the motion resulting from the pressure against said yielding incline or inclines, for the purpose of forming a rotary dynamometer. Also, the revolving and sliding cone adjusted in its position according to the power applied from the pulley to the shaft, when combined with a registering apparatus to record the amount of power made use of.

148. WASHING MACHINE; Charity Pendleton, Galena, Illinois.

Claim—1st, The combination of the two horizontal bars or rails, J and M, having a circular reciprocating motion, with the fixed corrugated cylinder surface forming the bottom of the machine, and having its axis coincident with the axis of motion of the said bars, the parts being constructed and arranged as described. 2d, The combination of the slot or mouth in the arm, and the tenon at the ends of the corrugated rubbing bar, M, with the perforated bar, J, by which the portion of the said corrugated rubbing bar, M, may be altered with respect to the bottom of the machine, so as to increase or diminish its distance therefrom, and without altering the position of the bar, J. 3d, The combination of the corrugations on the lower surface of the rubbing bar, M, with similar corrugations on the bottom or concave of the machine, but so arranged that the direction of the two sets of corrugations will be at right angles to each other.

149. METHOD OF OPERATING WINDLASSES WHEN APPLIED TO HAY-PRESSES, &c.; Peter Philip, Ghent, New York.

Claim—1st, Attaching the wheel or table to the capstan, so as to be operated upon by the loose or boom-sweep as a brake, for the purpose of stopping the press at any point of descent, while being filled, and of regulating and controlling the motion of the capstan in the uncoil. 2d, Providing the capstan with the arms and the loose or boom-sweep, in combination with the check lever, in the manner and for the purpose set forth.

150. MACHINE FOR BORING HUBS; Daniel Quimby, Littleton, New Hampshire.

Claim—The shaft, the boss placed on said shaft and provided with a conical bore, and having the collar and arms attached, the screw rod connected with the collar by the gearing, and providing with the divided nut attached to the upright, arranged as set forth. Also, in combination with the parts above named, the convex projection placed on the shaft, to operate as specified.

151. POCKET REGISTER OF COUNT; P. D. Richards and F. N. Thayer, New Orleans, Louisiana.

Claim—The construction and arrangement of a hand-operating talley, consisting of three indexes and corresponding wheels to indicate count, as specified, the whole being operated by a projecting stud and spring brake with its gauge.

152. PEN AND PENCIL CASES; John Richardson, City of New York.

Claim—The arrangement of the spiral grooved sleeves and their connexion with the pen-holder and pencil, and also with the outer shell of the case, as described.

153. HYDROSTATIC LIFTING JACK; John Robertson, Brooklyn, New York.

Claim—The employment of the exterior movable hydraulic cylinder with toe-piece upon its surface, in combination with the standard, which serves also as piston and eduction pipe, as described.

154. SELF-DETACHING WHIFFLE-TREES; Wm. G. Russell, Winchester, Virginia.

Claim—A swingle or whiffle-tree provided with a lever turn bar, together with the spring clasp and the hinged or jointed hooking ferules, arranged as set forth.

155. COAL SIEVES; Silas T. Savage, Albany, New York.

Claim—The employment of the two half-globes, in which there are interstices, as a coal sifter, when said half-globes are provided with grooves, tongues, and shoulders, the same being used in connexion with a box or cylinder, by means of which the two portions of the globe are prevented from moving endwise of the trunnions and are prevented from separating.

156. SAWING MACHINE; T. W. Schmidt, Philadelphia, Pennsylvania.

Claim—The combined arrangement of the stationary frame fitted with the adjustable holders and the saw carriage operated by the crank, shaft, f', spur wheels, shaft, m, and rope or chain, whilst the saw is at the same time rotated through the media of the gear-wheel, pulley, and band, the said stationary frame and the said moving saw carriage, operating together as described.

157. MACHINE FOR MAKING HAND-RAILS FOR STAIRS; Cornelius R. Shaeffer, Gettysburgh, Pennsylvania.

Claim—The combination of the perpendicular square post erected upon the base with the draft-board, pitch-boards, rod, and arm, arranged as set forth.

158. CONFECTIONERY SAFE; Reuben Shaler, New Haven, Connecticut.

Claim—The confectionery safe, constructed substantially as specified.

159. CORN HUSKERS; George F. Shaw, Woburn, Massachusetts.

Claim—The combination and arrangement of the cylinder and concave roller, as described.

160. REFINING IRON; Christian Shunk, Canton, Ohio.

Claim—The use of the external crucible or hearth having the tweer pipe, the projecting stone, and the escape pipe, operating in such a manner that the blast shall deflect from the side of the upright stone and produce a rotary movement in the melted metal for the purpose of refining the same, as specified.

161. THRESHING MACHINES; Joseph Siddall, Philadelphia, Pennsylvania.

Claim—The combination of flails, roller, slides, and straps, when said flails are constructed with the flexible joints, the arrangement and operation being as set forth.

162. LOCK FOR FIRE ARMS; Michael Tromly, Mount Vernon, Indiana.

Claim—1st, The combination of the hooks, or their equivalents, respectively formed on the claw of the link and the trigger, as described. 2d, Widening the upper end of the trigger so as to form a projection in front, whose lower curved edge shall operate on the curved surface of the claw, in the manner set forth.

163. ARTIFICIAL STONE; J. L. G. Ward, Adrian, Michigan.

Claim—A cement composed of pumice-stone, silicate of soda, fluor spar, and Roman cement, as set forth.

164. PRESERVE CANS; Oliver N. Weaver, Dover, Kentucky.

Claim—The perforated elastic plug secured in the top of a provision can, with a nozzle and tube communicating with an exhausting chamber, as set forth.

165. TRAP FOR ANIMALS; Loren Wetmore, Tioga County, Pennsylvania.

Claim—1st, The peculiar construction and arrangement of the manifold trap, as set forth. 2d, The arrangement of the trip provided with a fulcrum or fulcra, guide pin, and arched wire, for operating the trap, as set forth.

166. ATTACHING THE HEADS OF METALLIC POWDER-KEGS, &c.; James Wilson, Charles Green, and Wm. Wilson, Jr., Wilmington, Delaware.

Claim—The double seaming of both heads of the keg and the opening in one head, in the manner described.

167. HOLLOW AUGER; Arcalous Wyckoff, Elmira, New York.

Claim—Combining the transverse auxiliary cutters with the prime cutters and elliptic opening of the annular cutter head, as described.

168. BREECH-LOADING FIRE ARMS; Peter Altmair, Assignor to self and Myron M. Faxon, Lewiston, Penna.

Claim—In combination with a fixed breech-piece, a hinged barrel, so arranged as that the said barrel shall swing upward and expose the chamber of the breech-piece, below the rear end of the barrel, for inserting the charge, as described.

169. MONEY-DRAWER ALARM; R. M. Campbell, East Cambridge, Assignor to self and Benjamin S. Wright, Boston, Massachusetts.

Claim—The combination and arrangement of the two levers and the spring latch with the clock-alarm apparatus, the striker, and bell, and the combination of the same and a series of perforated key slides and a set of T-bars applied together and to such levers so as to actuate the same. Also, the combination and arrangement of the T-bars and the perforated key slides, to operate in manner described. Also, in combination with the key-lock and the T-bar, I, a latching apparatus placed in the case, and constructed so as to lock both the cover and the T-bar, or either, as specified. Also, the combination of the detector or indicator with the case cover and the T-bar, H, and operated in manner specified.

170. SAFETY APPARATUS FOR CITY RAILROAD CARS; Samuel Green, Lambertsville, New Jersey, Assignor to self and W. R. Green, Philadelphia, Pennsylvania.

Claim—The swinging frame in connexion with the bolt and the cover, the brake blocks in connexion with the chains and rods, and the stationary supporting piece, or their equivalents, arranged in the manner described.

171. CLASPS FOR SKIRT HOOPS; Samuel B. Guernsey, Waterbury, Connecticut, Assignor to W. H. Reed and G. W. Zeigler, City of New York.

Claim—Connecting the hoops with the straps, or equivalents thereof, for connecting and suspending them by means of plates bent to embrace the hoops, and formed with two slots or apertures, through which the straps, or equivalents, pass, thus clasping the straps, or equivalents, to the hoops, as described. Also, the employment of the metal clasps, constructed as above described, in combination with and as a means of connecting the ends of the hoops, as described.

172. CATTLE GATES FOR RAILROADS; Moses Hall, Jr., Assignor to self and S. H. Judy, Osborn, Ohio.

Claim—Constructing a cable guard or gate with its cross-bar or shaft below the rail of the railroad track, and operated by springs, as described.

173. APPARATUS FOR PACKING FRUIT; Robert Law, Lockport, Assignor to self and P. T. Dix, Olcott, N. Y.

Claim—The V-shaped or wedge-acting yoke provided with fulcrum pins, and the hooked recesses in the upper ends of the bent clamping levers arranged and acting in combination with the screw, fulcrum link, and claws, or their equivalents, in the manner specified.

174. SEWING MACHINES; Sidney Parker, Assignor to self and Hugh Herringshaw, City of New York.

Claim—The combination of the hook and the feeding arc, in the manner set forth. Also, the method of adjusting the feed, by means of the combination of the spring piece and the feeding arc, in the manner described.

175. SUGAR MILLS; John Paynter, Assignor to self and John McCorkle, Shelbyville, Indiana.

Claim—The combination and arrangement of the journal, wheel, gearing, and rollers, the whole being suspended in a frame, and constructed as described.

176. WINDING SKEINS OF THREAD; Asa T. Ring, Newton, Assignor to N. T. Spear, Boston, and A. J. Robinson, Milton, Massachusetts.

Claim—The combination of the clamping spring, screw, and guide pin or rod, with the tightening and supporting shank and bobbin, arranged as specified.

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177. WASHING MACHINE; Lewis Allen, Sleepy Creek, Virginia.

Claim—The construction of the open hollow washing, rinsing, and dipping cylinder, composed of a series of bars placed at regular intervals from each other, and provided with an open net-work. Also, in combination therewith, the fluted or ridged pressure, squeezing cylinder, and detachable framing, arranged in the manner described.

178. VARIABLE EXHAUST DEVICE FOR STEAM ENGINES; Jacob Barney, Chicago, Illinois.

Claim—1st, The employment of two cylinders so provided with gradually tapering grooves in each, that when revolved together, an expanding and contracting circular opening will be formed for the purpose of regulating the passage of the exhaust steam from locomotive and other engines. 2d, The cylinder, as constructed, when used in combination, the tight metallic case and packing, arranged in the manner set forth.

179. UNIVERSAL JOINTS; James Baylor, Canton, Illinois.

Claim—Connecting shafts, when placed angularly with each other, by means of the universal joints, constructed as described, by which a rotary motion may be transmitted from one shaft to the other.

[This invention consists in the employment of a cylindrical coupling box, having two slotted bars pivoted within and at either end of the box, at right angles to each other, to the centres of which the ends of the shafts are pivoted, so that a rotary motion can be conveyed from one shaft to the other when they have a considerable inclination, thereby dispensing with the beveled wheels commonly employed for this purpose, and obtaining a regularity of motion with very little friction.]

180. BOOT-TREES; W. H. Bettes and I. H. Parker, Kokomo, Indiana.

Claim—1st, The employment of the sleeve in connexion with the screw shaft, the two being arranged as set forth. 2d, The arrangement of the cords with the levers, in the manner set forth. 3d, The combination of the instep, side-pieces, and toe-piece, when so arranged that they will operate simultaneously, as described.

181. BEDSTEAD CORD-PIN; J. T. Bever, Mainesville, Missouri.

Claim—A bedstead cord-pin, consisting of two parts, which are constructed and operated in the manner described.

[The invention consists in forming an eye through the ordinary pin, and having a turning-piece pass through said eye. This piece has a square head to receive a wrench; it also has ratchet teeth formed on it to gear with reverse set ratchet teeth formed in the side of the pin. The bed cord attaches to the inner end of the turning-piece, and consequently when said piece is turned, the cord is twisted and made tight; the ratchet teeth preventing any slipping after the desired tension on the cord is produced.]

182. SUGAR-CANE PRESSES; Wm. Bull, New California, Wisconsin.

Claim—The arrangement and combination of the hinged adjustable frame, E, roller, J, frame, A, wedge, inclined spouts, and roller, D, as described.

183. COTTON GIN SHARPENER; A. H. Burdine, Chulahoma, Mississippi.

Claim—1st, The combination of two-crossed reciprocating files with a circular feeding disc, which is constructed with an angular recess and an inclined hook at one point of its circumference. 2d, The combination of the above with a jointed slotted frame and a driving cam.

184. STOVES; P. N. Burke, Buffalo, New York.

Claim—The arrangement and combination of the perforated plates, the partition plate, the flue, the fire-guard, hot air-pipe, and chamber.

185. MACHINES FOR PLANING METAL; Jeremiah Carhart, City of New York.

Claim—1st, The pressure plate or plates, in combination with the reciprocating bed and feeding strip, when said plates extend substantially the length of the blank to be planed, and the bed travels far enough to carry the feeding end of the strip entirely past the facing cutter at each operation. 2d, Rebating the inner edges of the pressure plate or plates in such manner as to furnish at once edge guides and pressure for the blank while being fed to the cutters. 3d, In combination with the pressure plates and cutters, the shields extending downwards from the pressure plates to protect the space between the plates from shavings and other foreign matter. 4th, In combination with the reciprocating bed and feeder, the scraper and brush, acting in combination for cleaning the bed and feeder or feeding strip.

186. HARVESTERS; Herman Carter, Greene, New York.

Claim—The vibrating discharger, in combination with the rake, arranged in the manner described.

187. CANAL-BOAT PROPELLER; Robert Cartwright, Ithaca, New York.

Claim—The step or bearing block, arranged relatively to the rudder and vessel to receive the end thrust

of the propeller shaft, and thus relieving the gearing and rudder from pressure, the whole end thrust of the propeller being upon the step-block, which is arranged to admit of any lateral motion to the vessel's centre line, thus forming a steering as well as propelling power, and being all placed externally, it entirely obviates the necessity of entering the vessel below the water line.

188. COFFEE-POTS; William Chesterman, Centralia, Iowa.

Claim—The arrangement and combination of the piston-packed strainer, cylinder, receiving vessel, socket, and condenser, as described.

[By the peculiar arrangement of this coffee-pot, when the water in it is heated, the steam presses up through the strainer containing the ground coffee, and through a quantity of water above the strainer, so that when the pot is taken off the fire, a vacuum is formed in the lower portion of the pot, and the water above the strainer is forced through the ground coffee into the lower portion of the pot, whence it is drawn off by a spout, and the upper portion of the pot is provided with an air-tight vessel, which acts as a condenser for the vapor of the uppermost water, so that no aroma escapes.]

189. VEGETABLE CUTTER; John Clary, Dayton, Ohio.

Claim—The arrangement of the cutting disc suspended from the cross-piece in connexion with the convex cutting edge of the cutters, in the manner set forth.

190. DOUBLE-ACTING PUMPS; William H. Davis, Austin, Indiana.

Claim—The construction and arrangement of the air chamber, side pipe, and cylinders, and flanch at the top, all in one piece of casting, for the purpose of suspending the cylinders sufficiently deep in the well to prevent freezing, in combination with the bottom plate.

191. STOVES; Rufus Dawes and W. C. Choate, Washington City, D. C.

Claim—The combination of a new fire-room for a downward draft, having a lid to close the opening at the top, containing a valve in the lid and an open grate in front, having a door to close this opening air-tight, with a system of ovens heated and ventilated.

192. ROTARY CULTIVATORS; B. F. Field, Sheboygan Falls, Wisconsin.

Claim—The combination of two or more wheels on one crank eccentric, or equivalent axle, when the said wheels are arranged in pairs on the axle, one wheel within the other, and so as that the spades or forks attached to the inner wheels shall pass out and in through the apertures in the outer wheels, for the purpose of displacing and pulverizing the soil over which they pass, in the manner described.

193. STOVES; J. D. Field, Davenport, Iowa.

Claim—The fire-chambers, D I, flue, and water heater, the latter being provided with inclined tubes to form the grate of the fire-chamber, D, the above parts being arranged relatively with each other, the oven, and the smoke-pipe, to operate as set forth.

194. VARIABLE CUT-OFF GEAR WITH STEAM ENGINES; Ambrose Foster and Noah Sutton, City of New York.

Claim—The employment for operating either the main valve or valves of an engine or a separate cut-off valve or valves, of a compound cam, composed of two parts, C and D, constructed and combined with each other and applied to the main or a counter shaft, as described.

195. LOCK FOR SAFES, &c.; August Freutel, City of New York.

Claim—1st, The slotted wheels, m, on the tumbler, l, and the plates, in combination with the wheels, 6, of the knobs, when said wheels, m, are so arranged that the act of unlocking, or attempting to unlock, the bolt moves the wheels, m, away from the wheels, 6, in the manner specified. 2d, In combination with the tumbler, l, carrying the wheels, m, and acting as aforesaid, I claim the cross-piece and tumbler, as set forth.

196. HARVESTERS; C. B. and G. B. Garlinghouse, Allensville, Indiana.

Claim—The peculiar arrangement of the disc in relation to the mechanism for operating the cutters, the standard, and sliding frame, in the manner specified.

197. TRIMMER FOR LAMP WICKS; Halvor Halvorson, Cambridge, Massachusetts.

Claim—In combination with a knife and bed or anvil, or other suitable wick-cutting devices, gauges, arranged as shown, or in such a manner as to hold or retain the wick, and prevent it expanding laterally, while under the action of the cutting device.

198. LATHES; Jacob Hess, Niagara Falls, New York.

Claim—The combination of the grooved central shaft with its movable discs, adjusting gears, and index spring hook, all arranged in relation to each other, as set forth.

199. MACHINES FOR RAKING AND LOADING HAY; Grove Howard, Westfield Township, Ohio.

Claim—The arrangement of the endless belt, pulleys, curved teeth, rods, lever, and catch in the frame, and with the body, constructed and operating as specified.

200. BIT-STOCK AND WRENCH; L. S. Hoyt and B. B. Beers, New Fairfield, Connecticut.

Claim—1st, The wimble or bit-stock wrench with one permanent and one movable jaw, which may be readily adjusted to turn nuts or screws of different sizes. 2d, The block, or its equivalent, with a socket adapted to receive and hold the shanks of common bits and fitted to the permanent or movable jaw, or both, so as to hold the block and bits. 3d, The screw, so arranged as to fasten the block on to the jaw and the bit in the socket at the same time.

201. STEAM COCK; Wm. Johnson and Martin Silmser, Auburn, New York.

Claim—A plug cock, with a sectional plug, whose sides are inclined to its axis, in combination with a single casing through which and directly opposite are openings whose sides are parallel to the axis of the plug, and constructed as described.

202. JOINT FOR PUMP-PIPES; David Knowlton, Camden, Maine.

Claim—Making the joint hemispherical, in combination with the stiff or rigid flanches, by which the parts joined hemispherically may be held at the desired angle.

203. SHIPS' WARPING CHOCK; David Knowlton, Camden, Maine.

Claim—The cast iron warping chock described.

204. HOSE COUPLING; A. H. Lowell, Manchester, New Hampshire.

Claim—The locking devices described, in combination with the screw tube, arranged in connexion with, and on the outside of said locking devices.

205. Grain Separators; Franklin I. May, Beverly, New Jersey.

Claim—1st, The two side or supplementary inclined planes, in combination with the short inclined plane and the two adjustable guides, arranged together so as to operate as described. 2d, The employment of the sliding board in the shaker, when the said board is arranged to operate in combination with the screens therein, for the purpose of better preparing the grain, &c., for the inclined planes and the rotary screen.

206. Foot-stoves; James H. Maydole, Eaton, New York.

Claim—In combination with a foot-stove, the several parts thereof being arranged in the order specified, the employment of a lamp constructed with an intermediate space filled with plaster of Paris, or the equivalent thereof, whereby I am enabled to prevent the heating of fluid contained therein.

207. Machine for Turning Skins; Isaac C. Mayer, Jersey City, New Jersey.

Claim—The implement, constructed and operated as herein described, for the purpose of turning the skins used by furriers.

208. Furnace Grates; E. I. McCarthy, Saugerties, New York.

Claim—A furnace with a series of stationary grate bars, in combination with a series of movable blades, so arranged as to pass between and above the bars, and descend below so far as not to obstruct the draft and be beyond the influence of the intense heat of the furnace.

209. Excavating and Grading Machine; Z. N. Morrel, Cameron, Texas.

Claim—1st, The employment of a revolving cylinder of blades, arranged at the lower end of the inclined digger, in combination with said digger, and with a series of coulter ploughs, arranged at the front end of the machine. 2d, The employment of a revolving cylinder of teeth or blades, arranged at the upper end of the inclined digger, in combination with said digger.

[By this invention the soil is first cut up in long narrow slices, then divided transversely into small clods, next elevated and pulverized, and then conveyed by endless longitudinal apron conveyers, which discharge it at right angles to or on one side of the grade or ditch.]

210. Machine for Scouring and Polishing Coffee; William Newell, Philadelphia, Pennsylvania.

Claim—The combination of the two cylinders, having a space between them, with the scarified arms or beaters moving in contrary directions.

211. Railroad Car Brakes; William Perkins, Plympton, Massachusetts.

Claim—1st, The arrangement of the sliding buffers, brake levers, rod, i, hooked rods, b b′, and staple, to operate in combination with the brake. 2d, Arranging the brake shoes, in combination with the staple and hooks, m m′. 3d, The arrangement and combination of the hooked rods, l l′, and the rods, o o′, and with the staple, so that the hooks, m m′, can be adjusted according to the direction in which the car is to run. 4th, The arrangement and combination of the sliding buffer, lever, and spring, as specified.

212. Mode of Heating Drying Cylinders by Steam; A. P. Pitkin, Hartford, Connecticut.

Claim—In combination, the closed heating cylinders, force pump, vacuum valve, and connecting tubes, in the manner set forth.

213. Saw Gummer; William Porter, Mexico, New York.

Claim—1st, The arrangement and combination of the lever with the sliding box by means of the bar, m, so as to give a continued and downward action upon the cutter or burr by the use of the coiled springs, thereby feeding the said cutter or burr. 2d, The arrangement and combination of the index pointers, with the index and the bars, t t′, connected to the frame, so as to give any required direction to the cutter or burr. 3d, The use of the set-screw by means of which the distance between the blocks is adjusted proportionally to saw plates of different thicknesses prior to being fastened thereto by the eccentric lever.

214. Oscillating Steam Engines; John A. Reed, Jersey City, New Jersey.

Claim—The arrangement of the reversing valve in a steam chest on the top of a bridge-piece, in combination with the separate passages in the bridge-piece communicating the chambers in the trunnion boxes.

215. Apparatus for Working Pumps; Benjamin Robbins, Machias, Maine.

Claim—The combination and arrangement of the crank, fly-wheel, lever, walking beam, and piston rods, as set forth.

216. Furnace for Dental Purposes; Edward A. L. Robbins, City of New York.

Claim—The arrangement and application of the double inclined grates, as set forth. Also, in combination with such inclined grates, the parts to contain the muffle, retort, &c., as set forth.

217. Hay Press; Charles Rundlett, Alden, and John W. Drummond, Winslow, Maine.

Claim—The arrangement of the driving drum or windlass and driving gear with reference to the press-box and the platen screws and their pinions, disposed on the sides of the press-box. Also, the combination and arrangement of the connecting rods and rings with each platen-elevating screw, and the bars of the cover of the press-box, the whole being to operate as specified. Also, the mode of applying the draft-rope guide to the press frame and the driving pulley, that is, by means of a fulcrum, and the screw or projection made to enter the helical groove of the driving pulley.

218. Edge Planes; Henry Sauerbier, Newark, New Jersey.

Claim—The bevel wheel, e, pinion, worm, wheel, o, socket shaft, pinion, feed wheel, cutter head, gauges, roller, lever piece, and corliss head, arranged as specified.

219. Hydraulic Motor; Morrill A. Shepard, Orin, Illinois.

Claim—The combination of the vacuum tube, e, and tube, c, for giving motion to the water-wheel by the action of an undammed stream, as described.

220. Metallic Bung; T. Briggs Smith, Marietta, Ohio.

Claim—A metallic screw bung for casks, or other wooden vessels, for holding liquids, with a knife-like thread, and an elevation at any point between the threads, and a shoulder on the bung let into the stave.

221. Furnaces; Lewis Solomon, City of New York.

Claim—So constructing a desulphurizing furnace for roasting the ores of precious metals, as that the heat shall be applied first beneath the sole of the furnace and afterwards on the surface of the ore, when the same is combined with a chamber arranged in the base of the chimney for the reception of such volatilized particles of ore, &c., as may be driven off by heat or carried over by the draft.

222. Snow Ploughs; M. B. Spafford, Warsaw, New York.

Claim—The vertical rotary shaft with its spiral wings for the removal of snow from the railroad track, as described.

223. Lasts; Obed S. Squire, New Haven, Connecticut.

Claim—The arrangement and combination of the longitudinal sections, strips, and bolt, as described.

[By this improvement the manufacture of india rubber boots and shoes is much facilitated, the lasts being made in two halves, so that the shoe or boot can be widened without the length being increased and varieties of shape obtained without the necessity of tabs upon the last.]

224. Meat-masher; George Storer, New Britain, Connecticut.

Claim—The hollow or solid cylinders with pointed angular teeth, the base of which teeth has nearly in contact, and in combination therewith, the device for adjusting the cylinders, as specified.

225. Stoves; John G. Treadwell, Albany, New York.

Claim—The combination of the division, c, with the damper and doors, arranged in the manner specified.

226. Stoves; John G. Treadwell, Albany, New York.

Claim—The employment of hinged plate, in combination with the hearth-plate above, the two being used in the manner specified.

227. Elbow for Stove Pipes; A. K. Tupper, Clarkson, Michigan.

Claim—Constructing the joint of pipes with flanch, f', and the overlapping flanch, f', so as to allow the pipe to be adjusted at any desired angle.

228. Machine for Cutting Heels and Soles for Boots and Shoes; Albert Warren, Jefferson, Ohio.

Claim—The bent knife, y, resting on the shoulders of the movable slides, as described. Also, the knife, y, resting on the shoulders, in combination with the knife, q, adjusted as set forth, and by which any size or shape of leather may be cut, ready to be sewed or pegged upon the boot or shoe.

229. Harvesters; W. A. Wood and J. M. Rosebrooks, Hoosick Falls, New York.

Claim—In combination with a main frame supported upon two driving wheels, and which frame carries the shaft and main cog-wheel, a second frame, hinged to said shaft, so that the crank shaft on said second frame shall always be in a radial line to the main cog-wheel, however much said second frame may vibrate on the main frame.

230. Fastening for Bedstead Drapery; George W. Watrous, Hartford, Connecticut.

Claim—A drapery fastening, constructed of a case, hook, and link, as described.

231. Pumping Engine; Henry R. Worthington, Brooklyn, New York.

Claim—1st, The combination set forth and exhibited of two direct-acting pumping engines, propelled by steam or other fluid, so arranged as that each engine shall actuate the inlet and outlet valves, governing the motive power of the other, thereby ensuring the constant action of at least one pump piston upon the water, and relieving the action of the pump from shocks and concussions. 2d, The arrangement shown of two distinct systems of levers adapted to the steam and exhaust valves of each engine, the one system to be operated upon for producing motion and for determining the duration of the repose of the piston at the termination of the stroke, the other for bringing the pistons to a state of rest.

232. Railroad Switches; Jacob Beachler, Assignor to self and J. F. Brickley, Anderson, Indiana.

Claim—The obstruction or "scotch" applied to the turn-out and connected with the switch so as to be operated automatically by the movement of the same.

233. Elbows for Stove Pipes; Norman Bedell, Assignor to S. P. Bedell, Albion, New York.

Claim—1st, The employment of the metallic frame, constructed in the manner set forth. 2d, The combination of the clasp with the frame, as constructed, for the purpose of holding the miter edges of the pipe together.

234. Machine for Polishing Corks; H. F. Cox, Jersey City, New Jersey, and Alex. Miller, City of New York, Assignors to H. F. Cox, aforesaid.

Claim—The cork-polishing machine, consisting of a series of rollers roughened by a surface of pumice-stone, or equivalent abrading material, and a brush or brushes acting in conjunction to polish the cylindrical portion of machine-made corks.

235. Dies for Shaping Articles in Metal; Levi Dodge, Assignor to self and Dodge & Blake, Waterford, New York.

Claim—The forming of articles of iron, or other metal, when such articles are to be shaped by a simultaneous action or pressure of dies on several or all sides, the employment of the movable dies, operating substantially upon the principles set forth.

236. Corn Huskers; Moses H. Gragg, Assignor to self and T. N. Page, South Boston, Massachusetts.

Claim—The arrangement and combination of the small intermediate conical roller, larger conical rollers, guard, and hopper, as described.

237. Stoves; Joseph C. Henderson, Assignor to Rathbone & Co., Albany, New York.

Claim—1st, The air-space between the oven and the fire, when so arranged that a descending draft the whole width of the stove passes through said space, and thence to the fire, for promoting combustion, and at the same time rendering the temperature of the oven more uniform. 2d, The damper at the front end of the oven, in connexion with the descending flue between the front plate and fire-box, whereby the oven can be entirely closed when the stove is in use for roasting.

238. Churn; Lorenzo Lake, Assignor to self and Wm. Patton, Middlebury, Pennsylvania.

Claim—The dasher, made in the manner as described, when the same shall be operated by the devices, as described.

239. Journal-boxes for Railroad Cars; Robert McWilliams, Assignor to S. H. Hoffman, Philadelphia, Pa.

Claim—1st, The upper half of the box with its socket formed by the flanches, in combination with the lower half of the box, when the two halves are arranged so that on adjusting the lower half to its place it may assume the position shown in fig. 1, and so that when adjusted the end of the oil chamber shall be close to the axle. 2d, The self-adjusting leather packing and the metal plate, when both are dependent upon the

lower half of the box for their proper position within the other half, and when they are otherwise arranged in respect to both upper and lower half of the box, as set forth.

240. SEWING MACHINES; Louis Planer, Assignor to self and Joseph Auger, City of New York.

Claim—The combination of the peculiarly constructed notch which is confined to the upper half of the shuttle, and leaves the lower half intact, with a driver having a single horn or finger, which entering the said notch constitutes a guard to prevent the flying up of the heel of the shuttle.

241. HARVESTING MACHINES; George W. Richardson, Assignor to self and G. M. Weed, Grayville, Illinois.

Claim—The application of the rack upon the reciprocating bar and pinion upon the vertical shaft, connected and arranged for operating the two sickles at the same time by the cam wheel.

242. DAMPER FOR COOKING STOVES; Lyman L. Thomas, Dighton, Massachusetts, Assignor to the Dighton Furnace Co.

Claim—A damper placed in the outlet of the return flue of a cooking stove, near the termination of said flue, and of such a form that when secured or hinged at its lower end to the side of the flue opposite the oven, and when partially or fully closed it shall stand in a position more or less diagonal across the flue, and of such a length that it can never be moved more than twenty-five degrees from a perpendicular.

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243. MODE OF SETTING LOGS IN SAW-MILLS; Asa Brooks, Tolland, Connecticut.

Claim—The application and combination of the gear and screw-shaft, the traveling ratchet and chock, the stops and the spring pawl, for the purpose as described.

244. BREAD SLICER; H. F. Bond, Hudson, Wisconsin.

Claim—1st, The movable tray operated automatically by the motion of the knife, in the manner set forth. 2d, The bar, arranged as desciibed.

245. TWEER; S. L. Bond, Greenwood, South Carolina.

Claim—The arrangement and combination of the two pipes, C C, having their orifices opposite to each other, with the air chamber, so that the two currents of air on entering the chamber will oppose each other, and thus uniformly diffuse the air, as described.

[The invention consists in introducing air from the bellows-pipe, and compressing it to a certain degree into an air chamber, the cover of which is perforated with a number of holes, so that the air escaping from the chamber is spread over a comparatively large area and with a uniform force. This cover when burnt out is so arranged as to be easily replaced by a new one.]

246. IRON FOLDING BEDSTEAD; John Biberthaler, City of New York.

Claim—The arrangement of the bed bottom in two parts, one of which, A, being about two-thirds of the whole length of the bed, and to which the legs are attached capable of turning under said part, when required, and attaching the other part, D (and which forms the upper or head part of the bed), to the legs nearest the head, in such a manner that the said part, D, may be turned over the top of the bottom part, A, while the legs to which the same is attached are turned under the said part, A, in the manner described. Also, fixing the head part of the bed, D, when unfolded, either to the legs, B, or to the bottom part, A, by means of bolts or pins, in such a manner that by said bolts the inclination of said part, D, may, at the same time, be regulated to any desired position.

247. REEFING SAILS; Henry Bessling, City of New York.

Claim—The slides, applied to work along the jackstay, or other suitable portion of the yard, in combination with reef-points extended from the back sail up through the jackstay or yard, and with the reef pendants. And, without confining myself to the particular construction of the pawls, I claim securing the reef by means of pawls applied to the yard, to operate in combination portions of the reef pendants made of chain.

[This invention consists in carrying the points of each reef of a sail up to the yard, and attaching them to slides which are fitted to work along the yard, and to which are attached the reef pendants. By hauling on the reef pendants, the slides are caused to move longitudinally, and to draw up the reef points, and so reef the sail from the deck.]

248. STEREOSCOPIC INSTRUMENTS; Alex. Beckers, City of New York.

Claim—1st, Placing the eye-glasses in a movable cylinder, in such a manner that opaque pictures, placed back to back, may be viewed by the same pair of eye-glasses, the direction of the said eye-glasses being varied by the partial rotation of the cylinder, to suit the opposite position of the pictures. 2d, The construction of the picture-holders with a double hook.

249. MACHINE FOR STONING CHERRIES; E. C. Custer, Evansburgh, Pennsylvania.

Claim—The machine for stoning cherries, constructed in a manner specified, with its spirally grooved cylinder and adjustable stripper, arranged as set forth.

250. FLOUR BOLTS; J. M. Clark, Philadelphia, Pennsylvania.

Claim—The slide valve, or a series of slide valves, without holes in them, so arranged and operating with the apertures in the sides of the bolting chest, that either of these apertures can be opened or closed or both closed when required, for the purpose of turning the material as desired, in either of the three directions.

251. STEAM HEATING APPARATUS; B. Wells Dunklee and W. B. Moore, Boston, Massachusetts.

Claim—The combination of the tubes, casing, inner and outer reservoirs, and condensation pipes, and escape pipe, with its valve, with petticoat chamber and vaporizing pipe, and the use of the iron known as the Poleux patent metal alloy coating, as set forth.

252. DOOR FASTENING; Charles Frost, Waterbury, Connecticut.

Claim—The employment or use of the drop plate, constructed of the form and applied to the door or doors, as set forth.

253. HARVESTERS; Henry Fisher, Alliance, Ohio.

Claim—Attaching the draft or draw bars to the arms, L L′, in the manner set forth. Also, the peculiar arrangement and combination of frames, tongue, spur, and arm, g, in relation to each other and to the main shaft, to operate in the manner specified.

254. Machine for Feeding Paper to Printing Presses; G. H. Ferguson and Sylvester Ferguson, Malden Bridge, New York.

Claim—Feeding sheets of paper, singly, to a printing press, paper-ruling, or other machine, requiring the feed of a single sheet at a time, by means of a feed roller, G, feed roller, I, and adjustable friction stop, or the equivalents thereof, arranged as specified.

255. Locomotive Boilers; B. L. Griffith, Hazleton, Pennsylvania.

Claim—The deflectors, arranged within the space between the fire-place and the tube sheet of a locomotive boiler, in combination with openings in the fire-box for the admission of atmospheric air.

256. Sewing Machines; E. A. Goodes and E. L. Miller, Philadelphia, Pennsylvania.

Claim—The combination of the needles, the hook, and the tongue, arranged as described.

257. Submarine Helmet Window; C. M. Gould, Worcester, Massachusetts.

Claim—The application to submarine helmets of the above described window, in the manner described.

258. Piano-fortes; Charles Glassborow, Philadelphia, Pennsylvania.

Claim—Constructing the string frame of an upright piano with two pin blocks, and other appliances for receiving two sets of strings, and two distinct sounding boards, the strings being arranged one set on one side, and the other set on the opposite side of the frame, the two sounding boards being connected together, and the whole being otherwise constructed in the manner set forth.

259. Valves for Water-closets; James Gilfillan, Hartford, Connecticut.

Claim—The combination of elastic tubular spring, piston, and chamber, operating in the manner described.

260. Furnaces of Locomotive Engines; Richard Gill and G. W. Grier, Altoona, Pennsylvania.

Claim—In combination with the fire-box of a coal-burning locomotive boiler, a water deflector, having a series of small openings through it, and extending up over the fire, as represented, and an air passage behind or over it, which communicates with the external air, for the purpose of introducing atmospheric air in small jets over the fire.

261. Pump; Enos Hartzler, Orville, Ohio.

Claim—The arrangement of the pipes, valves, springs, x x x x, and spring, a, with the rod, box, and stock, combined and operating as specified.

262. Sawing Machine; E. H. Hancock, Augusta, Georgia.

Claim—1st, The combination of the yielding guard levers, or their equivalent, with the rotary saws, as described. 2d, The head blocks, swinging guide, circular saws, and guard lever, arranged as set forth.

263. Sewing Machines; Wm. Hall, North Adams, Massachusetts.

Claim—1st, The combination of the needle-carrier, pivoted bar, connecting rod, J, slide. I, pitman, and crank, arranged in the manner set forth. 2d, The combination of slide, I, and rod, J, or its equivalent, with a vibrating needle-carrier, in such manner as to produce two vertical motions on the needle, during each single horizontal motion of the slide, I, in the manner set forth.

264. Washing Machine; George Hall and Alonzo Scudder, Morris, New York.

Claim—The employment of a corrugated flexible metallic concave, stretching across the lower part of the machine, as described.

[A corrugated concave is used in connexion with a swinging, corrugated, and convex rubber, both being placed in a suitable box or case.]

265. Rotary Pumps; C. H. Hersey, Boston, Massachusetts.

Claim—The combination of the flanched shaft with the hinged valve and cone, as described.

266. Bedstead; Benjamin Hinkley, Troy, New York.

Claim—The arrangement of the dovetailed tenons on the end rails. and corresponding dovetailed mortises in the full posts, with the side rails and longitudinal tension rods, as set forth.

267. Water and Alarm Gauge for Steam Boilers; F. A. Hoyt, Boston, Massachusetts.

Claim—The arrangement of the balanced valve chamber and valve, the leading pipe thereof, and the whistle, with reference to the dry steam chamber, the indicator chamber, and the valve lever, and the indicator hand, connected together and arranged in the two chambers, as specified.

268. Printing Machines; Richard M. Hoe, City of New York.

Claim—Stopping the sheet of paper as it issues, after its first side is printed, and imparting to it a retrograde motion, thus returning it backwards, or in reverse order, to the impression cylinder, for the purpose of printing the second side, by the means described.

269. Force Pumps; Frederic Kettler, Milwaukie, Wisconsin.

Claim—The combination and arrangement of a force pump, as described.

270. Force Pump; Frederic Kettler, Milwaukie, Wisconsin.

Claim—The combination and arrangement of a force pump, as described.

271. Mills for Crushing Quartz; George T. and Wm. F. Kearsing, Butte City, California.

Claim—The arrangement and combination of the driving shaft, arms, rods, and runner, as described.

272. Machines for Enameling Mouldings; Robert Marcher, City of New York.

Claim—1st, The elastic or yielding sides of the hopper, arranged as set forth. 2d, In combination with the hopper, the reciprocating dog attached to the bed, and operated as shown, and also in combination with said hopper, the feed rollers, either or both feeding devices being employed for the purpose specified.

273. Bedstead; Charles Messenger, Warren, Ohio.

Claim—The angular and oblique slot and pin, in combination with the plate or key, when arranged in connexion with the jointed rails, as described.

274. Sewing Machines; Joseph W. Morton, Plainfield, New Jersey.

Claim—My improved loop-check or thread-holder, for the Wheeler & Wilson sewing machine, viz: a loop-check or thread-holder, which is composed of hair bristles, or other suitable fibres, by compacting them

into a firm mass of suitable size, and then combining the same with a sewing machine, in such a manner that the ends of the said fibres will bear against a portion of the rotating hook of said machine.

275. Machines for Manufacturing Waved and Corrugated Metal Plates; Richard Montgomery, City of New York.

Claim—The combination of the peculiarly constructed roll, I, with the peculiarly constructed roll, J, arranged in relation to each other, as shown, whereby the manufacture of the waved corrugated metallic plate, with margins of greater thickness than the middle, as patented to me on the 21st of June, 1859, is facilitated, while a portion of each corrugation is formed at the same time, as described.

276. Machine for Manufacturing Waved and Corrugated Metal Plates; Richard Montgomery, City of New York.

Claim—The combination of the peculiarly formed roll, I′, with the peculiarly formed roll, J′, arranged and operating in relation to each other, as shown and set forth, whereby the manufacture of the waved, corrugated, metallic plate, with margins of greater thickness than the middle, as patented to me on the 21st of June, 1859, is facilitated, while only "one corrugation" is formed at the same time, as described.

277. Shirt Studs; Daniel Morris, Bangor, Maine.

Claim—The improved manufacture of shirt studs, as constructed, with a metallic facing and an anti-soiling spool or guard, arranged as specified.

278. Platforms between Railroad Cars; Joseph Newman, Baltimore, Maryland.

Claim—The expanding mesh or lattice work described, when attached by a single point at each end, in the manner set forth, to be used as a bridge or gangway between railroad cars.

279. Gates for Railroads; Ira Robbins, Hughesville, Pennsylvania.

Claim—The shafts, S S′, having arms, as described, in combination with the shaft, B, lever, A, train of wheels, C C C, spring detent, g, spring, f, and the several rods connecting the aforesaid parts, as set forth, for operating the sliding gate.

280. Springs for Railroad Cars; David B, Rogers, and Joel A. Wood, Pittsburgh, Pennsylvania.

Claim—The combination of a series of plate springs, arranged as described, with a box in which they are inserted, and a follower, the spring box being either separate from or forming part of the truck, in the manner set forth. Also, making and using the plates or leaves of the spring of different thicknesses in the same series, for the purpose of adapting the spring to the varying degrees of pressure to which it may be subjected from time to time.

281. Gold Washers; Harrison Roberts, Mormon Island, California.

Claim—The arrangement of the sluice, in combination with the hopper and with the supply channel, in such a manner that the water strikes the dirt from below, and that the hopper is made self-supplying.

282. Biscuit Board; Isaac R. Shank, Buffalo, Virginia.

Claim—The arrangement and combination of trap-boards, beveled strips, levers, and vertical pins, in the manner set forth.

[This is a frame or chest so constructed as to hold meal and flour, with a table on the top on which the dough can be worked, and trap-doors in this table which, when closed, are perfectly flush with it, can be opened into the flour or meal receptacles by simply pressing on pins, they being opened and closed by a system of levers and pins.]

283. Shirt Studs; Henry Simon, Providence, Rhode Island.

Claim—The movable elbow piece, spring, and lever, applied in combination with each other and with the fixed shank, and in relation to a fixed elbow piece, as described.

284. Sewing Machines; Isaac M. Singer, City of New York.

Claim—Making the needle-carrier with a mortise, in combination with the needles, a series of blocks having parallel sides grooved to receive the needles, and with a clamp screw, or its equivalent.

285. Nine-pin Balls; John Taggart, Roxbury, Massachusetts.

Claim—The nine-pin ball, composed of a hollow metallic body and a covering of india rubber, or other suitable elastic material.

286. Boring Tools; George J. Washburn, Worcester, Massachusetts.

Claim—Giving the stock or shaft of a boring screw, driving, or other tool, a continuous rotary motion in one and the same direction, by means of a nut or sleeve, which is moved in a rectilinear reciprocating direction on said shaft.

287. Construction of Railroads; Amos Webb, Savannah, Georgia.

Claim—The arrangement of the ties in alternate reversed inclined positions, as described.

[This invention consists in placing or laying the ties or sleepers of railroads angularly in the ground, or in such position that their sides will be inclined relatively with vertical planes and their upper surfaces inclined from a horizontal plane.]

288. Apparatus for Warming by Steam; Charles A. Wilson, Cincinnati, Ohio.

Claim—The valves, adapted and arranged in the lower or discharging end of the branches, coils, or radiators of a system of steam heating pipes, and closable automatically by heat, in the manner explained.

289. Steam Radiator; Charles A. Wilson, Cincinnati, Ohio.

Claim—The arrangement of a series of tubes or boxes provided with corresponding apertures and nozzles, to permit circulation of steam and receive bolts or rods, which extend from top to bottom of the tier, the whole being adapted to admit of varying the extent of radiating surface while that of the floor room occupied remains unchanged.

290. Churn Dashers; Parker Wineman, Loydsville, Ohio.

Claim—A cylindrical dasher for churns formed with a perforated top provided with a movable cap or cover and with hinged valves, arranged in such manner that cream may be received within the dasher at each downward motion thereof.

291. Safety Guard for a Ferry Wharf; Edward F. Woodward, Brooklyn, New York.

Claim—The employment of the apron, for the purposes set forth.

292. VENETIAN BLINDS; George H. Woodworth, Brooklyn, New York.

Claim—The eyes or staples passing the cords and attaching the tapes to the blind slats, in the manner specified.

293. ORE WASHER AND AMALGAMATOR; John N. Wyckoff, Brooklyn, New York, and Thomas M. Fell, Orange Mines, Virginia.

Claim—A concentrator, constructed with a series of boxes or partitions, having curved bottoms communicating one with the other, and driven transversely for the purpose of separating poor from rich deposit.

294. GOLD AMALGAMATOR; John N. Wyckoff, Brooklyn, New York, and Thomas M. Fell, Orange Mines, Virginia.

Claim—The application of heat by steam, or otherwise, to vessels, pans, or cylinders, keeping the contents well triturated or mixed at an elevated temperature, so as to amalgamate the prepared ore by the use of mercury and alkali, as specified.

295. WOOD SAW; Eliza Blake (Executrix of Robert Blake, deceased), Assignor to Blake & Son, Albany, N. Y.

Claim—The new manufacture of wood saws, in the manner set forth, meaning by this, to claim only the sole right to manufacture, according to the mode of construction herein set forth, the special kind and character of saws known as wood saws, and clearly defined and represented in the description and drawings.

296. CLOTHES FRAME; J. Burr, Baltimore, Maryland, Assignor (through mesne-assignment) to George A. Fayman, Washington City, D. C.

Claim—The seat, capable of movement on the shaft in one direction only, and provided with the weighted detent and the ring movable thereon without bearing against the shaft, in combination with the shaft, arms, braces, and cords, arranged as described.

297. PIANO-FORTES; J. W. Fischer, Assignor to self and Charles Fischer, City of New York.

Claim—The bar beneath the dampers and above the piano strings, actuated by the levers, or their equivalents, in the manner specified.

298. SCREW STOCKS; Simeon Goodfellow, Assignor to self and John Fish, Troy, New York.

Claim—The cutting die, in combination with the vibrating circular plug and the movable holder, arranged as specified.

299. CHURN; Alfred Guthrie, Assignor to Wardell Guthrie, Chicago, Illinois.

Claim—The combination and arrangement of the cranks connected by the plate, or its equivalent, in the manner described.

300. GLASS-POLISHING MACHINES; Albert H. Hook, City of New York, Assignor to Wm. A. Horstman, Brooklyn, New York.

Claim—The combination of the apparatus for producing the reciprocating longitudinal motion and continuous lateral motion given to the polishing blocks, consisting of the screws, worm-wheel, worm, and its connexions with the driving power.

301. FIRE-ESCAPE LADDERS; Hezekiah Johnston and Wm. J. Matthews, Assignor (through mesne-assignment) to Hezekiah Johnston, Collinsville, Illinois.

Claim—The combination of the endless belt with the folding ladders and the platform, in the manner described.

302. MACHINE FOR CRACKING SUGAR; James H. Murrill, Assignor to Egerton, Dougherty, Words & Co., Baltimore, Maryland.

Claim—The employment of a vibratory saw, in combination with a gauge plate and hopper, arranged for sawing off slabs of sugar and directing them between crushing rollers. Also, the employment of rollers moving in unison with each other, constructed with cruciform cutters, for the purpose of perfectly dividing slabs of sugar into regular cubic portions. Also, the construction of a hopper provided with parallel grooves, or their equivalent, in combination with a circular saw, constructed in the manner set forth.

303. COFFIN SCREW; W. H. Nichols, Assignor to A. H. Markham, W. H. Nichols, and David Strong, East Hampton, Connecticut.

Claim—The employment of plates, or their equivalent, for the purpose of securing or retaining the caps or covers of coffin screws or tacks.

304. HOISTING CRANES; J. Y. Parce, Assignor to self and D. B. DeLand, Fairport, New York.

Claim—The main arm of a crane, arranged with the double diagonal braces and with the guide rollers, to operate in combination with the arm jointed to the same by means of the oval pin, as set forth.

305. PORTABLE SAWING MACHINE; Samuel R. Smith and Philander P. Lane, Assignors to Lane & Bodley, Cincinnati, Ohio.

Claim—1st, The idle friction pulley, operating in combination with the arbor and feed driving a circular saw. 2d, In the described connexion with the transverse rack, the gearing, ratchet wheel, pawls, lever, and stop, which operate, by their rigidity, in one direction, to transmit a forward movement of the rack to the knee, yet permitting the retraction of said rack. 3d, The described arrangement and adaptation of the weighted eccentric friction pawl, for the exact retention of the knee to the place of setting. 4th, The described arrangement and adaptation of the perforated rack, pinions, knee, and screen, for the exclusion of dust.

EXTENSIONS.

1. FAN MILLS; Isaac T. Grant, Shagticoke, New York; patented July 10, 1845; extended July 5, 1859.

Claim—The manner in which I have arranged the screen and the chess-board, and combined them with the screens ordinarily used, so as to obtain two distinct currents of wind, and to subject the falling grain to the stronger currents below the screen and chess-board, thereby blowing off the heavier portions of foreign matter, whilst the chaff is blown off by the ordinary currents in the upper compartments of the shoe.

2. SHAPING IRREGULAR SURFACES IN WOOD; Warren Hale and Allen Goodman, Dana, Massachusetts; patented July 22, 1845; extended July 26, 1859.

Claim—The method of copying or forming the longitudinal irregularities of piano legs, and other similar articles, on rough blocks of wood, by means of a carriage moving longitudinally against the revolving cutter, and holding both the pattern and the rough block, the cutting tool being raised and depressed for depths of cut by rollers resting on the patterns.

Additional Improvements.

1. Preparing and Mounting Slates; Hubbard Beebe, New Haven, Connecticut; patented March 29, 1859; additional dated July 5, 1859.

Claim—The combination of leather, or cloth, or felt (or felting), instead of, or in addition to, india rubber and gutta percha, so far as beauty, and economy, and desirableness in use may require, with the metallic band or rim around the edge of the slate, as patented March 29, 1859. Also, the combination of leather and cloth with my metallic rim, or with a water-proof cement of such strength and stiffness as will warrant, to some extent, the disuse of said metallic rim, especially in mounting slates in portfolio form or forms.

2. Hanging Window Sashes; Theodore F. Hall, Marietta, Ohio; patented December 21, 1858; additional dated July 26, 1859.

Claim—The improved arrangement of cords, pulleys, and weights, for hanging the sashes of windows, so that either or both sashes can be retained in any desired position in the frame, the sash and weights being suspended and moving on cords attached to the frame.

3. Picker Sawing Machines; John Haw, Old Church, Virginia; patented June 23, 1857; additional dated July 26, 1859.

Claim—Attaching the saw guides to the overhanging bearing, so as to adjust them to the sawing of small logs.

Re-Issues.

1. Faucet; Albert Fuller, Cincinnati, Ohio; patented October 16, 1855; re-issued July 5, 1859.

Claim—The elastic plug valve attached to a stem, when operated by an eccentric, or its equivalent, as set forth. Also, the elastic plug valve constructed as described, in combination with the cup-shaped cap to prevent the cup from spreading.

2. Faucets; James Powell, Cincinnati, Ohio; patented March 22, 1859; re-issued July 5, 1859.

Claim—The described arrangement of the cam, flanches, longitudinal slot, and spurs, combined and operating in the manner and for the purposes set forth.

3. Billiard-table Cushion; John M. Brunswick, Cincinnati, Ohio; patented December 8, 1857; re-issued July 12, 1859.

Claim—That order in the arrangement of the material composing a billiard-table cushion which places the cork in the rear, the rubber in front of it, and the paper, leather, and cloth, or the equivalents thereof, outside, in the manner set forth.

4. Fire Engines; L. Butler and R. Blake, Waterford, New York; patented November 30, 1858; re-issued July 12, 1859.

Claim—Combining with the water way or channel, the air chamber divided into two compartments by contraction, at or about one-half the height of said air chamber above the base or point of attachment to said water way, in the manner set forth. Also, in combination with the hour-glass contraction of the air chamber, the ring enlargement of the rock-shaft, as set forth.

5. Cleansing Caoutchouc; Austin G. Day, Seymour, Connecticut; re-issued July 12, 1859.

Claim—The use of alkali, or its equivalent, for separating bark, sticks, or other foreign bodies from crude caoutchouc and other vulcanizable gums, to prepare them for manufacturing.

6. Treatment of Crude Caoutchouc; Austin G. Day, Seymour, Connecticut; re-issued July 12, 1859.

Claim—Charging the caoutchouc, or other like gum, with alkaline liquor, or the equivalent, by means of the exhausting apparatus described and represented.

7. Cut-off and Working Valves of Steam Engines; George H. Corliss, Providence, Rhode Island; patented March 10, 1849; re-issued July 12, 1859.

Claim—The method, substantially as described, of operating the slide valves of steam engines, by connecting the valves that open and close the ports at opposite ends of the cylinder with separate crank-wrists, or their mechanical equivalents, so that from the motion thereof each valve, while its port is closed, shall move a less distance than it moves in opening and closing its port, while at the same time the two wrists by which the two valves are operated, have the same range of motion, as described, whereby I am enabled to save much of the power heretofore expended in working the slide valves of steam engines, and by which also I am enabled to make a greater proportion of the movement of the valve available for effecting a free passage of the steam through the ports of the cylinder.

8. Cut-off and Working Valve of Steam Engines; George H. Corliss, Providence, Rhode Island; patented March 10, 1849; re-issued July 12, 1859.

Claim—The combination of liberating valve gear with valves which are moved parallel to their seats, and continue their closing motion after their ports are closed, and commence their opening motion before their ports open, as described.

9. Cut-off and Working Valves of Steam Engines; George H. Corliss, Providence, Rhode Island; patented March 10, 1849; re-issued July 12, 1859.

Claim—The combination, substantially as described, of an air cushion with the liberating valve gear of steam engines.

10. Cut-off and Working Valves of Steam Engines; George H. Corliss, Providence, Rhode Island; patented March 10, 1849; re-issued July 12, 1859.

Claim—The combination with the part of the valve gear that appertains to a liberated steam valve of an instrument moved by the power of the engine in such manner as to effect the closing of the liberated valve whenever the independent means provided for that purpose fail to act in time.

11. Cut-off and Working Valves of Steam Engines; George H. Corliss, Providence, Rhode Island; patented March 10, 1849; re-issued July 12, 1859.

Claim—The combination of a helical cam with the opening and closing mechanism of the steam valve, as described.

12. CUT-OFF AND WORKING VALVES OF STEAM ENGINES; George H. Corliss, Providence, Rhode Island; patented March 10, 1849; re-issued July 12, 1859.

Claim—The method, substantially as described, of regulating the velocity of steam engines by combining a regulator with a liberating valve gear.

13. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—Hinging the finger beam to the main frame, so that it can be folded up thereon, as described.

14. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—Hinging the coupling arm to the frame at one side of the main axle, and supporting it by a brace hinged to a frame on the opposite side of the axle, in such manner as to obtain among other things a wide basis for bracing on a short frame without interfering with the folding-up the finger beam against or upon the frame to render the machine more portable.

15. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—The combination of the crank and the bearing for its journal, the cutter, the coupling arm, and the hinge of its inner end, with a hanger which is made the common support for the hinge of the coupling arm and the journal of the crank, arranged as set forth.

16. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—The method of folding the finger beam upon the frame by aid of the coupling arm with a lifting lever and cord, or the equivalent thereof.

17. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—1st, The combination of a knuckle with the joint which connects the finger beam and coupling arm, and the lever for raising the finger beam off the ground, arranged as set forth. 2d, The combination of a lever, arranged to turn on a pivot and to vibrate laterally with notches, and a catch to support the lever at any required elevation, together with the coupling arm and finger beam suspended to it.

18. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—The arrangement of the hand lever, driver's seat, and foot lever, whereby the driver may, when necessary, employ both his hands and his feet to raise the finger beam.

19. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—The combination of the spring pawl and the teeth with the gib and key of the connecting rod and cutter.

20. MOWING MACHINES; C. Aultman and L. Miller, Assignors by mesne-assignment to C. Aultman & Co., Canton, Ohio; patented June 17, 1856; re-issued July 19, 1859.

Claim—The combination of the shoe which carries the end of the finger beam, next the main frame, with a hinge brace bar, whose axis of motion at the end connected to the main frame is in a line with that of the corresponding end of the hinged coupling arm.

21. MOWING MACHINES; Cornelius Aultman and Lewis Miller, Assignors by mesne-assignment to C. Aultman & Co., Canton, Ohio; patented June 17, 1856; re-issued July 19, 1859.

Claim—The combination, with the hinged coupling arm, of a hinged brace whose axis of motion, at the end next the main frame, coincides with that of the corresponding end of the hinged coupling arm.

22. MOWING MACHINES; Cornelius Aultman and Lewis Miller, Assignors by mesne-assignment to C. Aultman & Co., Canton, Ohio; patented June 17, 1856; re-issued July 19, 1859.

Claim—The construction and arrangement of the finger beam and the main frame, so that the beam may be turned on its hinge into an upright position, and then raised and leaned against the frame to elevate it out of the reach of obstructions and distribute the weight more equally upon the carrying wheels, when the machine is to be removed from one place to another where the mowing is to be done.

23. MOWING MACHINEE; Cornelius Aultman and Lewis Miller, Assignors by mesne-assignment to C. Aultman & Co., Canton, Ohio; patented June 17, 1856; re-issued July 19, 1859.

Claim—The combination of a hinged coupling arm, the finger beam, and a catch, whereby the finger beam can be turned, raised, and held up to render the removal of the machine from place to place more convenient and secure.

24. MOWING MACHINES; Cornelius Aultman and Lewis Miller, Assignors by mesne-assignment to C. Aultman & Co., Canton, Ohio; patented June 17, 1856; re-issued July 19, 1859.

Claim—Mounting the two driving wheels and one main gear-wheel upon a common axle, in combination with a ratchet wheel for each driving wheel, each ratchet wheel fitted with a pawl that can be made to stand in or out of gear with the ratchet teeth at will.

25. MOWING MACHINES; Cornelius Aultman and Lewis Miller, Asssignors by mesne-assignment to C. Aultman & Co., Canton, Ohio; patented June 17, 1856; re-issued July 19, 1859.

Claim—The combination of a ratchet wheel, a ratchet pawl, a spring acting on the pawl, and a bearing pin, or the equivalent thereof, for the spring, with the driving wheel and the axle of the main gear wheel, whereby one spring is made to perform the two duties of holding the pawl, both in and out of gear, with the ratchet wheel.

26. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—The combination of the inner shoe with a leading wheel, arranged as set forth.

27. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio; patented May 4, 1858; re-issued July 19, 1859.

Claim—The combination with the shoe of an adjustable sole, of the peculiar double runner form described, whereby the sole can be adjusted directly to the heel of the shoe, without the intervention of a link rod and joint.

28. Harvesters; McClintock Young, Jr., Frederick, Maryland; patented September 21, 1858; re-issued July 19, 1859.

Claim—Connecting the handle of the rake to a transverse shaft in such a manner that the rotation of the said shaft, when aided by the curved guiding rod, or its equivalent, will impart the within described movements to said rake, viz: a sweeping axial movement from the inner edge of the sector-shaped platform (or a little beyond the same,) over to the forward portion of said platform, and at that point instantly changing to an axial horizontal movement across the platform to the starting point, and so onwards in regular succession.

29. Cut-off Gear; George H. Corliss, Providence, Rhode Island; patented July 29, 1851; re-issued July 26, 1859.

Claim—Combining with the rocking levers, or their equivalents, for operating the valves, the shoulders on the spring bars, or their equivalents, as described. Also, in combination with the shoulders on the spring bars that operate the rocking levers, the employment of the gauge bars, or any equivalent therefor, to regulate the periods of closing the valves, whether the said gauge bars be regulated by a governor, or by other means.

30. Railroad Car Springs; David B. Rogers, Pittsburgh, Pennsylvania; patented Feb. 23, 1858; re-issued July 26, 1859.

Claim—Constructing a carriage or car spring of a series of two or more plates of steel, each of which is so curved or twisted that the longitudinal curve on one edge or side of each leaf or plate, shall be the reverse of the curve on the other side or edge; a longitudinal section through the centre of the plate midway from either edge is a straight line, or nearly so; said plates being so arranged relatively to each other that on both sides the curve at the edge of each leaf or plate, shall be in the reverse direction to the curve at the edge of the leaf or plate next above or below it.

31. Trigger-operating Revolving-breech Fire Arms; James M. Cooper, Assignee of S. W. Marston, City of New York; patented January 7, 1851; re-issued July 26, 1859.

Claim—1st, So constructing the lock of revolving-breech fire arms, as that the trigger used to fire the pistol, when drawn back, raises the hammer to full cock and there retains it, the revolving breech or barrels being at the same time rotated so far as to bring the nipple of one of the chambers or barrels in the proper position to be struck by the hammer in its descent, and the trigger being held in a drawn position ready for instantaneous firing. 2d, The use of a fly-tumbler or vibrating tooth intermediate between the hammer and trigger in trigger-operating fire arms, and the peculiar arrangement of the parts of the lock in connexion therewith, hereinbefore described, whereby the tendency of the main spring to cause the descent of the hammer is neutralized when the hammer reaches the point of full cock, so that the hammer having been raised by the trigger, may either be permitted to stand cocked or fired immediately, at pleasure, and greater ease in firing and steadiness of aim are secured.

32. Skeleton Skirts; The Shelton and Osborn Skirt Manufactuirng Co., Birmingham, Assignees of E. G. Atwood, Derby, Connecticut; patented October 19, 1858; re-issued July 26, 1859.

Claim—A skirt formed of elastic hoops and tape, or equivalent material, when the tapes are disposed across the hoops in opposite diagonal directions, and interlocked on opposite sides of the hoops at the point of crossing, and are confined thereto. Also, connecting the hoops by means of a series of loops formed by a continuous tape, or equivalent material, passing around the skirt, from one hoop to the other, in opposite diagonal directions, without interlooping or interlocking between the hoops.

33. Skeleton Skirts; The Shelton and Osborn Skirt Manufacturing Co., Birmingham, Assignees of E. G. Atwood, Derby, Connecticut; patented October 19, 1858; re-issued July 26, 1859.

Claim—A skirt formed of elastic hoops and tape, or equivalent material, disposed across the hoops in opposite diagonal directions, without being connected between the hoops, but connected to the hoops at suitable intervals.

Designs.

1. Cooking Stoves; James Greer and Rufus J. King, Dayton, Ohio; dated July 5, 1859.
2. Sides and Doors of Cooking Stoves; James Greer and Rufus J. King, Dayton, Ohio; dated July 5, 1859.
3. Spoon and Fork Handles; Henry Hebbard, City of New York; dated July 5, 1859.
4. Sun-dials; William W. Wilson, Pittsburgh, Pennsylvania; dated July 5, 1859.
5. Floor Oilcloth; James Bogle, West Newton, Massachusetts, Assignor to self and Daniel Bogle, Dover, New Hampshire; dated July 5, 1859.
6. Floor Oilcloth; James Bogle, West Newton, Massachusetts, Assignor to self and Daniel Bogle, Dover, New Hampshire; dated July 5, 1859.
7. Stoves; Garrettson Smith and Henry Brown, Assignors to J. G. Abbott and A. Lawrence, Philadelphia, Pennsylvania; dated July 5, 1859.
8. Fire Frames; Wm. W. Stevens, Westbrook, Assignor to N. P. Richardson & Co., Portland, Maine; dated July 5, 1859.

9 to 12. Carpet Pattern (four cases); E. J. Ney, Lowell, Massachusetts, Assignor to the Lowell Manufacturing Co.; dated July 5, 1859.

13. Clock Cases; John A. Munn, City of New York; dated July 26, 1859.
14. Cook Stove; David Hathaway, Assignor to Fuller, Warren & Co., Troy, New York; dated July 26, 1859.
15. Cook Stove; George W. and John Pittock, Union Mills, Assignors to —— Mosher and H. M. Chase, West Providence, New York; dated July 26, 1859.
16. Parlor Cooking Stoves; Wm. W. Stevens, Westbrook, Assignor to N. P. Richardson & Co., Portland, Maine; dated July 26, 1859.

AUGUST 2.

1. Axle-boxes for Lubricating Rolling Stock, &c.; Paul Francis Aerts, London, England; patented in England, March 19, 1858.

Claim—The wheel fixed on the end of the journal in railway rolling stock, raising water by centrifugal force, and the divergent for conducting the water over the greased surface of the journal or moving parts of machinery working in fixed bearings.

2. Casting Copper Cylinders; Freeborn Adams, Somerville, Massachusetts.

Claim—A tube or cylinder cast out of copper, and free from blow-holes, and other similar defects, when stated.

3. Knitting Machines; Jonas Bradley Aiken, Manchester, New Hampshire.

Claim—1st, The lever grooved eccentrically to its fulcrum, applied in combination with the sliding loop regulator to adjust the same for different lengths of loop. 2d, The stop-motion, consisting of the lever and its self-adjusting dog, the ring with its pins, or their equivalents, and the sliding bolt, or its equivalent, carrying the slipper.

4. Tool for Riving Hoops; William Baker, East Templeton, Massachusetts.

Claim—A hoop-riving tool, formed of a stock provided with suitable guiding surfaces, and differently arranged or set stock surfaces and knives for operation, as set forth.

5. Mode of Hanging Brake Rubbers; T. C. Ball, Keene, New Hampshire.

Claim—The combination of the brake-head and spring, also, the arrangement of the brake-beam, so as to allow its independent action upon brake-head and spring.

6. Show-case; Thomas L. Ball, City of New York.

Claim—The construction of a case or box divided into compartments, each box having a sliding cover, in combination with the spring covers and compartments.

7. Apparatus for Condensing Coal Oils; William T. Barnes, Buffalo, New York.

Claim—1st, The employment of a tube, the lower extremity of which is provided with tubular arms, the same being made to revolve, and being used in connexion with a tank partially filled with water, and a conducting pipe. 2d, The arrangement and employment of the tanks, constructed and used in the manner specified.

8. Apparatus for Generating Coal Oils; William T. Barnes, Buffalo, New York.

Claim—1st, The arrangement of the levers, L K and J, and rod, whether operated by a cam or otherwise, for the purpose of forming an automatic dust clearer to coal oil retorts. 2d, The employment of the spiral or screw flanches on the head of the retort for pushing the material away from the hole in the journal.

9. Mills for Crushing Sugar Cane; Daniel Bassett, White Water, Wisconsin.

Claim—1st, The arrangement and combination of the tongue and groove rollers, wiper, and "stripper," as described. 2d, The "stripper," when composed of spring caps and a movable cam, and when arranged and combined with rollers.

10. Elevators in Warehouses, Factories, Mines, &c.; Albert Betterley, Boston, Massachusetts.

Claim—1st, The combination of an automatic safety shipper and brake apparatus with an elevator, arranged to operate only to prevent an elevation of the car beyond a fixed limit. 2d, The combination of the weight, flexible rope or chain, with the shipping and brake-controlling mechanism.

11. Spring Bed-bottom; C. C. Bisbee, Rochester, New York.

Claim—The arrangement described of the slats, belts, rollers, cords, and springs, in the construction of spring bed-bottoms. Also, the unequal cams for the more perfect automatic adjustment of spring beds.

12. Machine for Raising Water, &c.; Abraham Bower, Pekin, Illinois.

Claim—The combination of the lazy tongs, the slide trough, and valvular bucket, as set forth.

13. Manufacturing Hoes; Samuel Boyd, Brooklyn, New York.

Claim—The employment of an anvil, having an inclined face, groove or recess, and socket, in combination with a mandrel, whereby the bevel or set of the blade and eye, and the form, thickness, and bevel of the interior of the socket or eye will be uniformly and simultaneously produced.

14. Pipe Tongs; J. R. Brown, Boston, Massachusetts.

Claim—The arrangement and application of the serrated surface or rack, the spring, and toothed stopper, with respect to the two jaw levers, the clamp nut, and the screw-pin, applied to the toothed jaw lever.

15. Draining Machine; Moses Bucklin, Grafton, New Hampshire.

Claim—1st, The arrangement of the platform with the cutter blade and plough-share, for the purpose of cutting underground drains. 2d, Arranging the blade with a sloping cutting edge, so that the same may readily pass over obstructions which may come in its way. 3d, The arrangement and combination of the platform, the cutter blade, and the plough-share, with the adjustable bars and wheels, to operate in the manner described.

16. Ironing Table; John F. Galley, City of New York.

Claim—1st, The treadle, the fulcrum arm, the upright shaft, the side jaws, the spiral spring, and the thumb-screw, arranged as described. 2d, The hollow screw collar on the shaft, constructed as described.

17. Portable Field Fence; T. B. Garside, Danville, Iowa.

Claim—The combination of the long main posts, short auxiliary posts, and triangular pivoted brace, or its equivalant, arranged as set forth.

18. Manufacture of Phosphoric Acids and Phosphates; Frederick Augustus Genth, Philadelphia, Penna.

Claim—The process of manufacturing phosphoric acid or phosphates, by treating the phosphates of iron, alumina, or lead, by means of sulphuric acid, or its equivalent.

19. Gas Burners; James Gilfillan, Hartford, Connecticut.

Claim—The improvement in gas burners described, consisting of a central exit tube supplied with apertures, surrounded by the gas chamber, having its discharge regulated by the mercury cup, the upper end of said pipe being furnished with a nozzle or jet-burner.

20. Cloth-holder for Washing Crockery, &c.; C. F. Greely, East Kingston, New Hampshire.

Claim—The described washing vise, constructed as set forth.

21. Churn; W. S. Hall, Quincy, Massachusetts.

Claim—The combination of the frame of stationary transverse bars with the rotary hollow shaft and hollow arms thereto attached for the introduction of air, and the solid arms attached to the shaft.

22. RECUMBENT CHAIR; P. J. Hardy, Boston, Massachusetts.

Claim—The peculiar construction and arrangement of mechanism described for actuating the back and leg rest, whereby they cannot only be brought from a vertical into a horizontal, or nearly horizontal position, so as to constitute a couch, but be maintained in such or any intermediate positions that may be desirable, such mechanism consisting of the levers, c c and d d, connected with each other, the back and leg rest or leg rest frame, respectively in manner as set forth. And in combination with the said construction and arrangement of mechanism for actuating the said back and leg rest, I claim the arrangement of the locking contrivance, whereby the back and leg rest, when placed in any desirable position, may be firmly secured in such positions or be released therefrom, as circumstances may require.

23. BREECH-LOADING FIRE ARMS; A. V. Hill, Hinsdale, New York.

Claim—The combination of the bed-piece, breech-pin, and connecting rod, which in connexion forms the sliding process, and operating as described.

24. SEWING MACHINES; Hiram W. Hayden, Waterbury, Connecticut.

Claim—1st, The attachment of the looping hook to an arm, or its equivalent, which has a revolving motion, and also a vibrating motion, in a direction transverse to its revolution, in combination with a bobbin, arranged relatively to it. 2d, The stationary cam, applied in combination with the revolving arm which carries the looping hook, and with a spring and sleeve, or their equivalent, for holding the said arm in contact with the said cam, to produce the vibrating motion of the said hook. 3d, The combination of the stationary cam and the fixed portion of the bobbin-holder. 4th, The looping-hook, made and fitted to turn in the revolving and vibrating arm, and provided with a pin or projection, operating in combination with a fixed stop. 5th, The extension of the mandrel forward of the rotating hook, for the purpose of carrying the spring and a sleeve, or its equivalent, by which the revolving and vibrating arm, which carries the hook, is kept in contact with the cam from which it derives its vibrating motion. 6th, The adjustable pin. applied and operating in combination with the revolving and vibrating looping hook and the bobbin. 7th, Feeding the cloth or material to be sewed by means of one or more smooth-faced angular projections on the feed bar, or its equivalent, and one or more ratchet-like wheels attached to the presser, said wheels being arranged with the lowest portions of their peripheries, above the bottom of the presser foot, and the said projections pressing the material into one notch at a time of each wheel, and operating in combination therewith, as described.

25. CAR COUPLINGS; E. L. Keeler, Pittsburgh, Pennsylvania.

Claim—The combination of a beveled coupling-head, shaped as described, with a spring as a coupling for railroad cars.

26. SEWING MACHINES; David Kelsey, Harper's Ferry, Virginia.

Claim—The horned eccentric or cam, applied as described, in combination with the vibrating pressure pad and the feeding dog, sliding on the stem of said pad, and operated by means of a stud, or its equivalent, attached to the needle-bar.

27. TOOTH KEYS; B F. Killam. Braintree, Vermont.

Claim—The hollow fulcrum, as described.

28. HARVESTERS; O. H. King, Salem, Iowa.

Claim—The arrangement and combination of the circular platform, rake, rod, guide way, endless chain or belt, wheels, and pin, arranged as set forth.

29. REVOLVING FIRE ARMS; S. C. Lewis and F. P. Pfleghar, Whitneyville, Connecticut.

Claim—1st, The centre-pin made in two pieces, one of which is fitted to the rotating cylinder, and to a rotating recoil shield with fins, and has applied to it within the cylinder a spring, and the other of which is fitted to slide and turn in the front part of the frame, and is capable of being locked to the frame. 2d, The dog, constructed and applied as described, to constitute its own spring, and operating transversely to the hammer, in combination with a peripherical ratchet. 3d, The stop, constructed with a tooth in its front, and a projection on its back, and applied and operating in combination with a spring, a ring of notches on the rear of the recoil shield or cylinder, and a tooth on the tumbler. 4th, The recoil shield, constructed with a peripherical ratchet, a ring of notches, a central bore, and slots.

30. BRAKES FOR RAILROAD CARS; H. A. Lincoln and H. T. Douglass, New Haven, Iowa.

Claim—The combined arrangement described of brake shoes, truck wheels, equalizing beams and springs, the former being outside of the wheels, and so supported as to rise and fall practically with the wheels, while the equalizing beams support the springs, and the springs are arranged between the wheels, and transfer the weight to be carried to the equalizing beams, the several parts acting in combination, in manner specified.

31. HARVESTERS; S. A. Lindsay, Unionville, Maryland.

Claim—The combination of the hinged guide-piece with the hinged platform, for the purpose of retaining the rake and the reels in their proper relative positions towards the platform, when the latter is raised or lowered. Also, the combination of the bar, shaft, and the hinged bar, with the movable frame of the machine, and the finger bar, for the purpose of raising and lowering the latter, without interfering with the free movements of the platform on its hinges.

32. MACHINES FOR CUTTING AND BINDING GRAIN; Frederick Meyer, Naperville, Illinois.

Claim—1st, The combination of the movable gates, the sliding divider, and the movable platform, as described. 2d, The construction of the tongs, and the mode of operating them. 3d, The tucker, for the purpose of fastening the free end of the band, as described.

33. MACHINE FOR EXCAVATING AND GRADING; Warren P. Miller, Marysville, California.

Claim—The use of the cylinders or wheels, for the purpose of depressing the chains so as to give to the excavators a proper inclination, and thereby facilitate the feeding and working of the same. Also, the construction and arranging of the excavators attached to endless chains, worked in the manner described, to wit: to fill and discharge, while traversing from one tumbler to the other, on the lower plane (from A to B), for the use and purpose of excavating and grading rail and turnpike roads.

34. JOURNAL-BOXES; John A. Montgomery, Williamsport, Pennsylvania.

Claim—A journal-box, formed of a sphere or segment of a sphere, fitting into a cup or concave, and prevented from revolving with the shaft or journal by a pin and slot, as described.

35. WASHING MACHINE; J. T. Mudge, Dayton, Ohio.

Claim—Arming the side of the tub and the plunger with round-headed knobs or pins, to act on the clothes, and allow the water to escape freely as it is pressed out of the clothes being washed.

36. Apparatus for Tapping Water or Gas Mains; E. T. D. Myers and C. F. Thomas, Washington City, D. C.

Claim—The method of drilling, tapping, and inserting stop or other cocks into cast iron water or gas mains or supply pipes, in the manner as set forth.

37. Branch-holder for Bonnet Stands; J. R. Palmenberry, City of New York.

Claim—A branch-holder, made and constructed in the manner described.

38. Manufacture of Common Salt; Henry Pemberton, East Tarentum, Pennsylvania.

Claim—The combination of processes described for the purification of common salt, to wit: washing common salt procured by the evaporation of salt water containing chloride of calcium and other impurities, with a saturated solution of chloride of sodium, or brine rendered pure by the use of chemical re-agents, substantially in the manner described, and the repeated use, for that purpose, of the same brine, for an indefinite number of operations, by treating it, after each process of washing the salt, with suitable chemical agents, whereby it is restored to its original purity.

39. Refining Coal Oils; Henry Pemberton, East Tarentum, Pennsylvania.

Claim—Recovering the sulphuric acid used from the residuum resulting from the process of the purification of coal oils, with sulphuric acid, by treating the residuum with water heated or caused to boil by steam, or otherwise, in the manner described.

40. Meat Cutter; John G. Perry, Kingston, Rhode Island.

Claim—Combining the revolving knives with a cylinder or block having studs on its surface, as set forth.

41. Machinery for Making Roofing Cement; Phineas Pomeroy and J. G. Allen, Middletown, Ohio.

Claim—The employment of the double-walled tank, in combination with the hollow metallic cylinders and valves, arranged as set forth.

42. Carriage Hubs; Jesse Pruette, Aurora, Illinois.

Claim—The enlargement upon box, having an annular flanch, for the purposes specified, in combination with the nut and its flanch, arranged as set forth.

[An annular flanch, with a concave recess formed on its inner surface, is cast upon the butt-end of the box, and this is driven into the hub. On the opposite end of the box a metallic nut is screwed, having a flanch upon its inner surface which projects into a corresponding cavity in the hub.]

43. Machine for Turning Hollow-ware; Lyman P. Rood, Deposit, New York.

Claim—The combination of the rotating mandrel with the adjustable slide provided with the tool-rest and cutter, arranged as set forth.

44. Sickle-guards for Harvesters; Andrew Shogren, Chicago, Illinois.

Claim—The cutter guard, constructed in the manner described, in combination with the guard socket and wedge-shaped bolt.

45. Corn Huskers; Daniel C. Smith, Tecumseh, Michigan.

Claim—1st, The combination of forceps, lever, stop, spring, and post, in the manner specified. 2d, The combination with the forceps of the slotted post, nut, and fork, in the manner specified.

46. Seeding Ploughs; John S. Snider, Lancaster, Ohio.

Claim—The arrangement of the swinging frame, wheel, crank shaft, with the hopper and mould-board, together with the devices connecting said parts, as set forth.

47. Machinery for Moulding Candles; George A. Stanley, Cleveland, Ohio.

Claim—1st, The moving of the moulds any distance lengthwise of the candles to detach the moulds from the candles formed in them, and to withdraw the moulds from the candles and place the jaws of the clutches around them. 2d, Moving the moulds by the weight of the moulds, and boxes containing the moulds, to adjust the jaws of the clutches to the candles, and attach the clutches firmly to the candles, so that they may be raised at the same time at which the moulds are returned empty to their first position.

48. Apparatus for Defecating Sugar; Richard A. Stewart, St. Bernard Parish, Louisiana.

Claim—The combination of the retort, the vacuum cylinder, and the receiver, in the manner set forth, and these I also claim, in combination with the steam boiler.

49. Brick Machines; H. W. Stillman, Port Washington, Wisconsin.

Claim—The combination of the revolving moulds, feeder, and plate, arranged in the manner described.

50. Flour-packers; Samuel Taggart, Indianapolis, Indiana.

Claim—1st, The oil-pot with cap, when operated in connexion with the clutch-wheel and shaft. 2d, The cam, in combination with the barrel-lifter, constructed as set forth. 3d, The combination and arrangement of the friction-brake, rod, walking beam, packing shaft, and barrel-lifter.

51. Pointing and Threading Wood-screws; N. G. Thom, Cincinnati, Ohio.

Claim—1st, The combination of a rotating head containing two or more spindles or blank-holders, revolving round a central point with an intermittent motion, with an apparatus for pointing and threading screw-blanks, so arranged and operated that while one blank is being pointed and undergoing the other operations necessary thereto, another blank is being threaded by another part of the same machine. 2d, In combination with an apparatus for pointing and threading screw-blanks, simultaneously, or nearly so, by the same machine, the apparatus so constructed and operated that while the spindles are rotated, or changing positions, the threading cam, or other device for operating the threading tool and its connexions, remains stationary, and when the motion of the spindles around the central point is arrested, the other part, and all necessary parts of the machine, recommence motion. 3d, The spring-brake, so constructed and operated that when the spring is being depressed to withdraw it from the notch in the plate, S, it acts as a brake upon the periphery of the plate, T, to arrest its motion, and the parts connected with it, at the same time relieving the plate, S, and allowing it to revolve with the spindles. 4th, The quadrant-shaped grooved arm on the pointing tool-stock, which, in connexion with the spring, or its equivalent, receives the blank from the hopper, and conveys it to the grippers, and supports it while being pointed. 5th, In combination with the quadrant, I claim the reciprocating motion of the hopper for the purpose of depositing the blanks in the quadrant, to be conveyed to the grippers. 6th, The triangular grooved cam, in combination with the hopper, so constructed that when moved in one direction by the action of the tool-stock, or otherwise, the hopper is depressed, and when moved in a contrary direction the hopper is elevated, for the purpose of depositing the blanks in the quadrant, or other mechanical device for receiving them. 7th, In combination with an apparatus for thread-

ing and pointing screw-blanks by the same machine, I claim the worm, when combined with the gears, or equivalent arrangement, by which the revolution of the worm causes the spindles to rotate round a central point. 8th, The rocking feed levers, for the purpose of regulating the depth of cut of the threading tool. 9th, The ratchet and revolving cam, when combined with the feed lever, for the purpose of raising the cutting tool out of the thread, in its backward motion, and increasing the depth of cut of the threading tool. 10th, In combination with the rod for opening the grippers, I claim the movable nut which acts upon the thread in the edge of the rod, to withdraw the cone and release the screw. 11th, The traversing arm, in combination with the spring lever, or its equivalent, for the purpose of removing the screw from the grippers when released. 12th, The sliding cam, in combination with the threading cam, for the purpose of removing the screw from the grippers and releasing it. 13th, The arm on the threading tool-stock, in combination with the threading tool and rod, or its equivalent, for the purpose of giving the proper form to the thread, and curvilinear shape to the point of the screw. 14th, In combination with the spindles or blank-holders, I claim the gears on the spindles, for the purpose of equalizing their motion and causing them to revolve round the shaft, while changing their position, whether the driving-belt rests or acts on one or both the spindles.

52. Lubricating Compounds; Horace Vaughn, Providence, Rhode Island, and Wm. Hutton, Baltimore, Maryland, Assignors to H. Vaughn, aforesaid.

Claim—"The cooling compound solution," as described.

53. Hemp Brakes; Allen Wilson and George C. Fletcher, St. Thomas, Missouri.

Claim—The arrangement and combination of the plates, M M′, N N′, O O′, each pair of plates moving in opposite directions through the medium of double cranks upon shafts, I L, as described.

54. Ship's Hoisting Apparatus; D. J. Wilcoxson, Milan, Ohio.

Claim—1st, Arranging the pawl and ratchet so as to allow the hoisting shaft to turn backward in lowering without disconnecting the pawl from the ratchet. 2d, Forming the connexion between a friction pulley and hoisting shaft, by means of a pawl and ratchet, so that the friction pulley is only in connexion with the shaft while lowering. 3d, The combination of the friction pulley, friction brake, and friction lever, arranged so that by the movement of the brake the friction pulley is released to revolve with the shaft, and power of the brake simultaneously applied to the pulley to regulate the velocity of the shaft in lowering. 4th, Combination of the vibrating pawl plates, cam levers, and the eccentrics, arranged as described, to give motion to the hoisting shaft.

55. Manufacture of Hats; Wm. F. Warburton, Philadelphia, Pennsylvania.

Claim—The process described of perforating the bodies of hats, by means of heated metal points.

56. Mole Ploughs; Augustus Watson, Walnut Run, Ohio.

Claim—Suspending the coulter to the lever and guiding it between rollers, so that it may be raised or lowered independently of the beam or frame of the plough. Also, making one or both of the beam plates adjustable, for the purpose of adjusting the position of the coulter so as to give it the proper tip or inclination. Also, in combination with the beam plates and the coulter, the grooved guide rollers, for the purpose of guiding the coulter in its vertical motion, and preventing any side or twisting motion of the same. Also, in connexion with the coulter and mole, the pivoted tongue, in the manner described. Also, in combination with the coulter and the mole, the link, whose ends are secured by a screw sleeve, for the purpose described.

57. Manufacture of Lint; Robert D. Dwyer, Assignor to A. B. and Daniel Sands, City of New York.

Claim—Surgeon's lint, produced directly from new flax, in the manner set forth.

58. Bending Plough Handles; John G. Ernst, Assignor to self and S. R. Slaymaker, York, Pennsylvania.

Claim—1st, The employment or use of the form block fitted in the frame with the chain attached, with or without the weight, in connexion with the roller and the toothed segments and stop, the latter being attached to the bed in carriage, arranged as set forth. 2d, The arrangement of the lever connected with clutch, the connecting bar, and the lever attached to shaft, in connexion with the rod and lever or button, whereby the operation of the machine, so far as the gigging back motion is concerned, is rendered automatic throughout. 3d, The movable rack, when adjusted and arranged with the wheel, for the purpose of stopping the feed or forward movement of the carriage.

59. Brick Moulds; James A. Hamer, Reading, Assignor to self and Norris Maris, Kimberton, Pennsylvania.

Claim—1st, The combination and arrangement of the operating parts of the brick mould, as described. 2d, The combination of the sides and partitions of the mould, operating as described. 3d, The combination of the levers with the arms and pins, for operating the sides and partitions of the mould, as set forth.

60. Sewing Machines; George L. Jencks, Assignor to self, George Kendall, and John Hendrick, Providence, Rhode Island.

Claim—1st, The combination in a single thread sewing machine of a perforated barbed needle, which is arranged obliquely to the feed movement of the cloth or material being sewed, with a pair of nippers, or other equivalent device, which will, as the inclined needle is operating to assist in forming the stitch, retain and present the thread to the needle, in a manner to allow the necessary loop to be formed, shortened, and drawn into or tight on the cloth. 2d, The combination with a barbed needle of the spring nippers, thread-guide, and adjusting nipper-closing bracket, arranged as set forth.

61. Clothes-dryer; Danforth Johnson, Assignor to B. B. Worden and Wm. Cadwell, Chicago, Illinois.

Claim—The employment of flexible braces, in combination with the freely-sliding collar on the spindles, for the purpose specified.

62. Bank Locks; Wm. Johnson, Assignor to self and Eibert Schumacher, Milwaukie, Wisconsin.

Claim—1st, Operating the regulator wheels or guard plates by the screw pins, which are susceptible of being changed in the holes of the plates, and in relation to each other, as set forth. 2d, The tapered indicators, stem and beveled plate of the stem, fitting into the tapered recesses, as set forth. 3d, In combination with a series of regulator wheels or guard plates, operated as described, I claim the means for indicating the position of such plates. 4th, The cock-wheel or toothed disc, in combination with the tumbler and the regulator wheels or guard plates, as described.

63. Casting Chilled Plates; Robert Poole, Assignor to self and G. H. Hunt, Baltimore, Maryland.

Claim—Making the chill for casting plates in sections, when said sections are secured to a bed-plate in such a manner as to leave spaces between them, which are filled with sand, or other yielding material, in the manner described.

64. Machine for Winding-up Clocks; John B. Powell, Assignor to self and George B. Frick, Philadelphia, Pennsylvania.

Claim—Without confining myself to any specific arrangement of parts, I claim the spring lever, spring

pawl or catch, and ratchet wheel, with the supplementary lever, and permanent pin, or their equivalents, applied in the manner set forth, to the winding-up of clocks, or other machines, in which a spring or weight is used as a prime mover.

AUGUST 9.

65. Apparatus for Heating Evaporating Pans; H. O. Ames, New Orleans, Louisiana.

Claim—The arrangement of the parallel evaporating pipes with their elbows, and collars, and screw nozzles, passing through the bottom of the pan, and the parallel external supply and escape pipes, with the nozzles and union couplings for making the connexions with the nozzles.

66. Seeding Machines; John Andrews, Clinton, Massachusetts.

Claim—The arrangement and combination of the vibrating bars or blocks, frame, axle, cam, and seed slide, whereby the cam which operates the harrow also moves the seed slide, and the harrow bars have a horizontal vibration, and also a vertical play with the frame upon the axle.

67. Seeding Machines; John Andrews, Clinton, Massachusetts.

Claim—1st, The arrangement and combination of the blocks, circular plates, teeth, levers, and seed sliders, as described. 2d, The arrangement and combination of the covering apron, bar, blocks, rod, and lever.

68. Brakes for Railroad Cars; Francis Armstrong, New Orleans, Louisiana.

Claim—Making the adjustment from the pull or the coupling, when actuating on distinctly detached parts, namely, the latch and tongues. Also, in combination, the arms, bar, and levers, arranged as described.

69. Machinery to Feed Sheets of Paper to Printing Presses; Moses S. Beach, Brooklyn, New York.

Claim—1st, Feeding sheets to the impression cylinders of printing presses, by means of revolving arms or scrapers, operating in combination with rollers, in the manner described. 2d, Retaining the paper in connexion with the impression cylinders of printing presses during the process of printing, by means of holders, in the manner described. 3d, Detaching the paper from the impression cylinders, by means of deflectors, as described.

70. Cotton Cultivators; G. W. Beard, Canton, Mississippi.

Claim—The peculiar shape given to the scrapers or cutters, and their lateral and vertical adjustment, in combination with the adjustable plough beams, arranged in the manner set forth.

71. Cotton Seed Planters; E. P. Beauchamp, Preston, Georgia.

Claim—The arrangement of the box, axle, wheels, side-pieces or frame, bolt, beam, stock, follower, furrow opener, and brace, as described.

72. Shingle Machine; Laurent Beaudreau, Fond du Lac, Wisconsin.

Claim—The relative arrangement, for united operation, of the intermediate circular revolving saw, open reciprocating double carriage, toothed clamps, bars, rollers, springs, inclined or curved guiding plates, horizontal rocking cradles, cams, shafts, bars, and hinged flaps or pawls, in the manner described.

73. Watch Cases; Philip Bettle, London, England; patented in England, November 18, 1857.

Claim—1st, The attachment of the inner case containing the movement of the outer case, by means of pins or pivots, so that the movement case can be turned over, to face the open or closed side of the outer case, without being removed from the outer case. 2d, Attaching the pendant handle to the movement case, so that it forms one of the centres or pivots, on which the watch turns, in connexion and combination with a pin or pivot on the opposite side of the case. 3d, The particular form and manner of constructing the pendant, and attaching the same to the inner or movement case before described.

74. Fishing Reel; William Billinghurst, Rochester, New York.

Claim—The combination of the skeleton ring with the other parts of the reel, arranged in the manner set forth.

75. Composts; Edmond Blanchard, Greenfield Mills, Maryland.

Claim—A fertilizing compost, composed of lime, chloride of sodium, wood ashes, charcoal, wheat bran, chimney soot, and gypsum, combined in the proportion and manner described.

76. Machines for Cutting Paper; E. Burroughs, Rochester, New York.

Claim—1st, The employment or use of the reciprocating and oscillating knife, arranged to operate as set forth. 2d, The knife, in connexion with the cone of pulleys attached to the shaft, s, the hollow shafts with their respective gearing, and the shaft, r, with its gearing, and the racks attached to the knife-bar by the rods, arranged as set forth. 3d, The arrangement of the shaft, u, with spring, the arm, cone of pulleys, levers, rack, for the purpose of automatically changing the movement of the knife from a descending to an upward movement. 4th, The clamp formed of the vertical and horizontal plates, arranged so as to be adjusted by the screw and pinion or worm-wheel, pinions, and racks, the latter serving in the capacity of both racks and guides. 5th, Attaching to the shaft, f, an index, arranged to move over a graduated stationary plate, attached to the frame, for the purpose of enabling the operator to accurately adjust the paper beneath the knife.

77. Adding Machine; J. T. Campbell, Rockville, Indiana.

Claim—The arrangement of a series of wheels provided with ten cogs or teeth, and carrying the ten numeric figures on their outward faces, in combination with the stationary plate containing like numeric figures, arranged on the circle, surrounding each of the wheels in the series. And in combination with the parts above claimed, arranged as described, I claim the stop-bars, and spring slides, and oscillating arms or pawls with the cam, arranged for joint operation as set forth.

78. Seed Planters; Walter Clark, Palmyra, Illinois.

Claim—The arrangement of the reciprocating agitating rod, when passing through the adjustable seed discharge opening in the side of the hopper, with the frame, wheels, pins, teeth, hopper, and adjustable slide, constructed as set forth.

79. Corn Harvesters; W. Cogswell and C. A. Mathewson, Ottawa, Illinois.

Claim—The circular cutter and the reciprocating sickle, with its stationary toothed plate, in connexion with movable bed, or fingers, the whole being placed on a mounted frame, and arranged as set forth.

80. Corn Planters; J. P. Coonley, Farmington, Michigan.

Claim—The arrangement of seeding roller, gear wheels, slide plate, lever, adjustable teeth, coverers, and tracking gauge, constructed as set forth.

81. CORN HARVESTERS; B. T. Currier, Bath, Maine.

Claim—The arrangement and combination of the scythe-shaped cutters, rods, cranks, adjustable frame, and standards, as described.

82. HOOP FASTENINGS FOR COTTON BALES; Edward Davidson, Batesville, Arkansas.

Claim—Forming the socket of two parts to admit of the same being opened to receive the bent or doubled and lapped ends of the bale hoop, and closed to secure the ends of the hoop together.

83. VULCANIZED GUMS; Alva G. DeWolfe, Seymour, Connecticut.

Claim—The use of pulverized, vulcanized rubber, gutta percha, or other vulcanized gum, in the manner specified.

84. CENTRIFUGAL GUN; C. S. Dickinson, Cleveland, Ohio.

Claim—1st, The employment of a lever provided with a collar which surrounds the shaft, pivoted or hinged, and provided with a pin or rod, as specified. 2d, Operating the lever in one direction, by means of rod and its connexions through the centre of the shaft, and in the other direction by means of spring, for the purpose of discharging the balls from the barrel at the proper time.

85. SEATS FOR SLEEPING CARS; Rudolph Dirks, Philadelphia, Pennsylvania.

Claim—1st, The cushioned platform and the frame, F, with its detachable cushion and movable legs, in combination with the permanent partitions, the said platform and frame being hinged together, and otherwise arranged as set forth. 2d, The boards, G and K, adapted to and sliding in or against the partitions, and arranged so as to form the foot and head-boards for the couches. 3d, The frame, H, as hinged to the side of the car, and the frame, I, so hinged to the frame, H, that both frames may assume the positions illustrated in figs. 1 and 2, in combination with the partitions and their sliding frames, G. 4th, Forming the upper couch of the board, L, hinged to the side of the car, and one or more boards, M, hinged to the board, L, when arranged in combination with the permanent partitions.

86. HEMP-BRAKES; Zachariah Feagan, Palmyra, Missouri.

Claim—The arrangement and combination of the stationary bars, finger guards, vibrating spring levers, and cams, constructed in the manner set forth.

87. PRINTING PRESSES; Andrew Dougherty, Brooklyn, New York.

Claim—The combination of the inking apparatus at the side of the main cylinder of a press, with a carriage that can be moved from and towards the main cylinder, and with a stop that controls the position of the carriage.

88. DIE FOR SWAGING BOLT-HEADS; Albert Eames, Bridgeport, Connecticut.

Claim—Making dies for swaging bolt-heads, and other articles, in two or more parts, the parts forming the bottom being fitted to and in the part forming the periphery, and the whole fitted to and secured within the drop, or equivalent therefor. Also, in combination with the die, the bottom of which is made separate from, and inserted in, the part forming the periphery, grooving the periphery of the part forming the bottom for the escape of air.

89. SEWING MACHINES; J. P. Emswiler, Knight's Tower, Indiana.

Claim—The combination of the slide, or its equivalent, with the feeding mechanism, for the purpose of adjusting the bed to the feeding mechanism for materials of various thicknesses, without changing the position of the feeding mechanism. Also, in combination with the bobbin, arranged to vibrate on the shuttle, the longitudinal arched pressure spring.

90. WINDLASSES; Moses G. Farmer, Salem, Massachusetts.

Claim—The combination of the roller, the ratchet wheel, B, the retaining ratchet, and the actuating ratchet, with the lever and toggle-joint, E, so arranged that the thrusting power of the toggle-joint shall be wholly exhausted when the lever is fully depressed, and the joint, E, brought into a straight line which intersects the axis, and the point of the actuating ratchet which is in contact with a tooth of the wheel, B. Also, the means described of permitting the backward motion of the roller, viz: by causing the motion of the lever to release, alternately, the actuating and retaining ratchets through the agency of such means as the springs, the projecting arms, and the proper position of the collar.

91. SEWING MACHINES; C. N. Farr, Philadelphia, Pennsylvania.

Claim—The arrangement of the fulcrum slide, stops, and looping bar, for regulating and adjusting the motions of the looper. And, in combination with said looping bar, adjusted as described, I claim the rocking lever, fitting and acting as specified.

92. GOVERNOR VALVES; Benaiah Fitts, Worcester, Massachusetts.

Claim—The manner of mounting the valve, that is to say, resting or supporting the valve, as shown at M, and retaining it into its seat, as shown at N, for the purposes set forth.

93. CULTIVATORS; Perley F. Freeland, Newark, Assignor to V. R. David, Morris, Illinois.

Claim—The arrangement of the tongue, curved or segment bar, beams with screw-rod, and pendants and shares, attached as set forth.

94. APPARATUS FOR FOLDING OR WRAPPING PAPERS; Edwin Gomez, City of New York.

Claim—The folders, formed with the lips and volutes, in combination with the intermediate twisters, in the manner specified.

95. PRINTING PRESSES; George P. Gordon and F. O. Degener, City of New York.

Claim—1st, Combining with the tympan frame the sheet-holding and relieving nippers or grippers, for the purpose of holding the sheet and for relieving the sheet from the type. 2d, The combination of a cylinder, or segment of a cylinder, with its wheel-bearers, the impression cylinder, roller pendants, and the racks or gearing. 3d, The frictionless roller, or its equivalent, in combination with the tympan frame, for the purpose of closing the tympan and properly laying the sheet upon the form in advance of the passage of the impression cylinder, or its equivalent. 4th, Operating the sheet-holding and relieving grippers by or through the motion of the tympan. 5th, Attaching a tympan frame to an adjustable bed in such a manner that they, at all times, shall retain their relative positions towards each other. 6th, Hanging, hinging, or attaching the inking apparatus to the frame of the press, or to the press, in such a manner that it may be turned, swung, or set aside, so as to allow the workmen to get at the form to make any necessary alterations, or to make the form ready, or for the purpose of using the bed as a composing stone.

96. FIRE-BOXES FOR LOCOMOTIVE ENGINES; Ralph Greenwood, Altoona, Pennsylvania.

Claim—The midfeather, when used in connexion with a gas chamber and fire-box, provided with open-

ings, the parts being arranged relatively with each other to operate as set forth. Further. the cylinders, when applied to the orifices of the gas chamber and fire-box, and connected by a lever to operate simultaneously, as set forth.

97. Potato-diggers; Leonard B. Griswold, Pennfield, New York.

Claim—The employment of a rotating head or disc, having teeth or spurs arranged around an upright shaft in a direction oblique to the axis thereof, in combination with the truck and driving wheels, or their equivalents, for giving the required motion.

98. Seed Planters; W. D. Harrah and B. S. Baldwin, Davenport, Iowa.

Claim—1st, The combination and arrangement of the peculiarly constructed hopper, regulating plate, sliding frame, slides, pitmans, edged leading wheels, hinged seed tubes, grooved covering wheels, foot lever, caster wheel, and hand lever, as described. 2d, In combination with the hopper, the arrangement of the foot lever and hinged bar, when the latter is so hinged as to throw the points of the seed tube forward in their adjustment, or when the foot lever is depressed.

99. Water-gauge for Steam Boilers; Robert S. Harris, Galena, Illinois.

Claim—The within specified manner of constructing and attaching the float stem to the boiler, whereby it is made to answer for carrying the float and as an index for indicating the height of the water in the boiler, and, if desirable, as a trip for opening a valve for an alarm whistle.

100. Sewing Machines; James Harrison, Jr., City of New York.

Claim—1st, The switching lever, constructed and operated as set forth, for directing the thread to the beard or barb of the needle, and preventing the escape of the thread therefrom. 2d, Controlling the feed and the stitch by the raising or lowering of the needle. 3d, Rotating the needle and carrying with it the thread, thus forming a twisted threaded-loop, as described.

101. Machine for Cutting Out Wooden-ware; George A. Hay, Berea, Ohio.

Claim—The rock shaft, in combination with the hoop-saw, arranged as described, and operated by means of the pinion, in the manner set forth.

102. Wood-Saw Frame; James Haynes, Hollis, Maine.

Claim—The inclined plane, ratchet, and the nipper or strainer, applied to the saw and frame, as described.

103. Mode of Generating and Applying Electric Currents in Telegraphing; Stanislas Hoga, Wm. P. Piggott, and Septimus Beardmore, Middlesex Co., England.

Claim—The application to telegraphic instruments of currents of electricity, produced from metals or substances arranged in the earth, or in natural bodies of water, in the manner and for the properties and relations described.

104. Steam Boilers; Robert Hooper, Baltimore, Maryland.

Claim—1st, Contracting that part of the boiler immediately above the fire-flues, in combination with the widening and extending of that part which is beyond or in the rear and above the end of the fire-box, as set forth. 2d, Forming a water-circulating passage below, in rear, and above the fire-box, and nearly or wholly isolating said passage from the fire-box, by means of a large space existing between the fire-box and the partition walls of the said water-circulating passage, as set forth.

105. Approach-opening Gate; Anthony Iske, Lancaster, and Jacob B. Erb, Conestoga Township, Penna.

Claim—The arrangement of the platforms and uprights to the lever, with the connecting rod attached to the arm on the slat, the groove on the inside of the post, for operating a series of cross slats connected by pivots with the slats, combined in the manner set forth.

106. Machines for Milking Cows; John W. Kingman, Dover, New Hampshire.

Claim—The teat-cups or tubes, partially covered at their upper ends with an elastic flanch, which will yield for the insertion of the teat, and gripe it so as to hold the cup upon the teat during the process of milking, and form a packing between the edge of the cup and the teat, which will be pressed against the teat by the external air when the internal air is exhausted; and, in combination with the device above claimed, I claim a vessel provided with an air-pump, and connected with said cup or cups by flexible tubes, so arranged as to exhaust the air and draw the milk from the cow, or other animal.

107. Railroad Car Wheels; Ebenezer A. Lester, Boston, Massachusetts.

Claim—Attaching the wheel to its axle by means of the auxiliary hub with its recesses and groove, and the segmental ring, or its equivalent, connected with the wheel, in the manner set forth.

108. Self-acting Battery for Scaring Crows, &c.; Theodore Lipshuts and Daniel C. Jones, Ballston Spa, N. Y.

Claim—The rising and falling box, arranged with the slide and apertures, and operating in combination with the dog and pulley, in the manner specified.

[The object of this invention is to arrange a battery with a number of chambers, in connexion with a gun barrel, in such a manner that its chambers, one after another, are made to go off at regular intervals without the aid of man, and, by these reports. frighten away injurious animals, and the invention consists in arranging a rising and falling box in such relation to a revolving battery, that when the box is filled with sand it sinks down and causes a hammer to discharge one of the chambers of the battery, and the box is so arranged that it discharges the sand when it reaches the ground, and it is raised by weights ready for a new charge.]

109. Machines for Milking Cows; Samuel W. Lowe, Philadelphia, Pennsylvania.

Claim—The cup with the perforated diaphragm, constructed to receive all the teats of the cow's bag, by having an opening in the diaphragm for each teat, and combined with an exhausting apparatus, constructed as described.

110. Device for Making Electro-magnetic Currents Constant or Intermittent; Moses Marshall, Lowell, Massachusetts.

Claim—The spring, so constructed and arranged as to be insulated from, or connected to, the two ends of the helical wire by springs, or otherwise, essentially in the manner set forth.

111. Kitchen Safe; W. McElwee, Shelbyville, Indiana.

Claim—The combination and arrangement of hollow posts with water cups, arranged in the manner specified.

[The body of this safe is mounted on hollow posts, extending from the floor to the top of the safe, and

they are provided with water cups near the bottom of each leg, which are connected by perforations with the compartments of the safe, so that cool air is always supplied to the safe without making perforations in its sides.]

112. SEEDING MACHINES; E. McKenney, Montgomery, Ohio.

Claim—The arrangement and combination of the distributing discs, levers, check valves, and buttons, to operate together with the hammer and with the bell, as set forth.

113. SEED PLANTERS; J. B. McMillan, Tipton, Indiana.

Claim—The planting and covering apparatus, when constructed and arranged in the manner set forth.

114. UNDERGROUND DRAINING MACHINE; Adam Miller, Mt. Pleasant, Iowa.

Claim—The combination and arrangement of the mole with the drain protectors, for the purpose of expeditiously and economically giving protection to the upper part of the ditch, and of disengaging the protectors from the mole plough with facility after they are laid.

115. DRIVERS FOR MILL-STONES; Alex. Miller, Newbern, North Carolina.

Claim—The employment or use of the friction rollers applied to the driver, in connexion with the plates, or their equivalents, fitted in the recesses adjoining the eye of the stone or runner, for the purpose of forming proper bearing surfaces for the rollers, the whole being arranged substantially as and for the purpose set forth.

116. HOOPS FOR SKELETON SKIRTS; Samuel C. Moore, Providence, Rhode Island.

Claim—The corrugated sheet metal hoop for ladies' skirts described.

117. DEVICES FOR HOLDING TOGETHER THE PANELS OF PORTABLE FENCES; Oliver P. Moran, Haynesville, Mo.

Claim—The arrangement of the notched projections or projecting pieces of the upper and lower rails, in combination with the right-angled notches in the end battens, in the manner specified.

118. CULTIVATORS; Samuel Mowry, Womelsdorf, Pennsylvania.

Claim—The arrangement of the axles, wheels, B, stretch-bars, levers, frames, wheel, C, ratchet bar, and cultivator bar, constructed as described.

119. HYDRO-CARBON VAPOR APPARATUS; A. A. Moss, Philadelphia, Pennsylvania.

Claim—The steam generator and dryer, in combination with a distinct hydro-carbon vaporizer, the same being also connected with the retort, and the whole arranged together so as to generate the steam and hydro-carbon vapor separately, and for their subsequently mingling and combination.

120. CORN PLANTERS; Matthew Mitchell, Alton, Illinois.

Claim—The arrangement of the frame, seats, hoppers, shoes, and cutters, with the device for operating them, in combination with the frame hung on the axle, and with the slides, operated as described.

121. ARRANGEMENT OF DEAD-BEAT ESCAPEMENT; Don J. Mozart, Yellow Springs, Ohio.

Claim—The improved arrangement of the double "scrapers" with the star scape-wheel, or its equivalent, as specified.

122. SKATES; Edward Norton, Boston, Massachusetts.

Claim—The metal straps, and the slotted plates and screw for tightening the skate to the foot.

[This invention consists in making the sole-plate, or what is more generally called the stock of the skate, of metal, and in two detached parts, and in pivoting them respectively to the heel and front parts of the runner, and in connexion with a skate thus made, in making the heel and toe straps for securing the skate to the foot of sheet metal, which are secured tightly to the foot by a peculiar fastening.]

123. POST-MARKING STAMPS; Marcus P. Norton, Troy, New York.

Claim—The blotter, connected or attached to the main part of any "post-office post-marking stamp," for the purpose of cutting and inking, blotting and effacing, so as to successfully cancel the frank or postage stamp of any letter or any package, at the same time and operation of marking upon such letter or package the name of any post-office, the year, the month, and the day of the month.

124. CULTIVATORS; Leonard Packard, Galesburg, Illinois.

Claim—The arrangement of the beams, the irons, and the projection on the ends of the beams, the adjustable arms, braces, blades, lifting rods, adjusting bar, levers, fulcrum, and hinged pole, as described.

125. EGG-BEATER OR CHURN; J. J. Parker, Marietta, Ohio.

Claim—The tube, in combination with the band and grated bottom, arranged in the manner described.

126. CLOTHES-FRAME; Horace Parkhurst, DeKalb, Illinois.

Claim—The combination and arrangement of the standards, the rails, the head-blocks, the clasps, the cords, as specified.

127. MODE OF UNITING SOLID SUBSTANCES; Dubois D. Parmelee, City of New York, Assignor to J. A. Greene, Beverly, Massachusetts.

Claim—The method and process described of uniting various substances or bodies of the same or different character and properties, by the interposition between the surfaces of said substances or bodies to be united, of one or more sheets or layers of india rubber and gutta percha, separately, or when combined with the substances, such sheets or layers having previously been treated in the manner described, to produce the change specified—whereby, on completion of said change, a water-proof cement is obtained, which, while it possesses the requisite rigidity and coherence to keep the bodies firmly and strongly united, possesses a sufficient degree of elasticity to compensate for the expansion or contraction of the fibres of the bodies, for the purposes set forth.

128. CORN PLANTERS; Lawson G. Peel, Webster County, Georgia.

Claim—The arrangement of the beam, stock, frame, bolt, hopper, wheel, and cylinder, as described.

129. FILING COTTON-GIN SAWS; Colwell P. Pool, New Market, Alabama.

Claim—The arrangement of the file-case with the file-holder and sleeves, to operate in combination with the bar, and with the slide and ridge, in the manner specified.

130. SEWING MACHINES; William F. Pratt, Bristol, Pennsylvania.

Claim—The construction of the thread-case with an angular projection extending across its centre, and the construction of the slide ring, or its equivalent, with a similar angular projection fitting to the said

projection, and operating in combination therewith in the manner specified, not only to prevent the twining of the thread-case, but to check and control the loops in their passage over said case, thereby avoiding the use of separate thread-controlling apparatus.

131. Furnace for Making Iron direct from the Ore; S. M. Quimby, A. H. Brown, G. H. Renton, and James Criswell, Newark, New Jersey.

Claim—The arch, the hopper-damper, the rods or bars, arranged as described. Also, the dampers at the bottom of the tubes, for discharging one or more tubes at the same time into one box or hopper.

132. Apparatus for Tanning; John B. Read, Cold Spring, New York.

Claim—An improved apparatus for tanning and other purposes, said apparatus consisting of one or a number of smooth, porous, or perforated surfaces of wood, or other fixed material, placed singly or in succession in open or closed vats or vessels, or arranged in pairs so as to form closed hollow cases, upon which skins, or other substances to be operated upon, are to be smoothly stretched, and then the tannin or other fluids forced through them by hydrostatic or other pressure into the interior, whence means of escape are provided, as described. Also, the use of tarpaulin sheet metal, or other water-proof substances, in form of sheets, to cover over the perforated parts of the cases not overlaid by the skins, &c., that the fluids used may be afforded no passage except by percolating through the skins.

133. Gas Retorts; Charles A. Robbe, Augusta, Georgia.

Claim—A gas generating chamber of a retort, made in two parts, when the said parts are constructed so as to lock together and form a tight joint by the simple act of sliding one portion into gear with the other.

134. Seed Planters; Theodore B. Rogers, Wethersfield, Connecticut.

Claim—The arrangement of slides, lever, former, floats, adjustable pins, and markers, as described.

135. Cultivators; James Rue, Englishtown, New Jersey.

Claim—The arrangement of the loose draft pole, bracket, cultivator frame, hinged rods, devices, bracket, and pin, arranged in the manner described.

[The invention consists in attaching the draft pole to the beams by means of hinged rods, which connect with the pole at a point above the pin, to which the draft animals are hitched, so that any strain exerted on that pin has a tendency to depress the rear end of the draft pole and to raise its front end, whereby the ploughshares are kept down to the ground without any extra exertion of either driver or animals, and as the pole is connected by hinged rods without any rigid fastening, the driver is enabled to accommodate the action of the shares to the inequalities of the ground, and at the same time the front ends of the shares can be raised and the cultivator drawn from place to place.]

136. Seats and Couches for Railroad Cars; Ezra D. Sargent, Indianapolis, Indiana.

Claim—1st, The side lounge or nurse couch, arranged as set forth. 2d, Its combination with the backs, seats, partitions, brackets, and stops, arranged as set forth.

137. Grinding-cylinders for Apple-mills; John Shæfer, Lancaster, Pennsylvania.

Claim—The tangential, curved, longitudinal, toothed cylinders, as set forth.

138. Nail-plate Feeders; John P. Sherwood, Fort Edward, New York.

Claim—The employment of the stationary inclined plane and the tumbler, having an inclined face, in combination with the arms of the hollow shaft of the plate-holder, and with the feed-screw and nut, and the driving cam, or their equivalent, operating together, as described.

139. Apparatus for Heating Evaporating Pans; Evan Skelly, Plaquemine, Louisiana.

Claim—The employment, in an evaporating pan, of a conical steam heater, with a central opening and a passage around its exterior and under its bottom.

140. Securing Artificial Teeth; N. B. Slayton, Madison, Indiana.

Claim—1st, Securing artificial teeth on plates of gold or silver, by means of an amalgam of gold or silver, or both, combined with mercury, as described. 2d, Forming, by means of said amalgam, an outer flanch or rim, covering and supporting the base of the teeth, as set forth.

141. Straw-cutters; Solomon P. Smith, Crescent, New York.

Claim—The arrangement of a crank shaft, pitman, knee-jointed lever, knife, with a straw box and cutter block, for conjoint use.

142. Mortising Machine; Abel Spencer, Jr., Southport, New York.

Claim—The frame made with cross-heads connected together by means of the jointed rods, and having those rods jointed at or nearly in line with the cutting edge of the chisel, and the mode of applying or using it, or any other manner substantially the same.

143. Tenoning Blind Slats; La Fayette Stevens, Elmira, New York.

Claim—Constructing the cutter-head with grooved cheeks, clamping nuts, and bearing studs, whereby the plane cutter knives are held in an oblique position with the plane of rotation with the cutting edge of the operating one, terminating in conjunction with that of the hollow hub and shoulder, arranged as set forth. Also, the combination and arrangement of the rest with stationary and movable upper and lower jaws and gauge, in the manner described. Further, the arrangement of devices for gauging the length of the slat, consisting of the automatic stop bolt, as operated by inclined plane and lever, to cause the carriage to stop alternately at the fixed stop-gauges.

144. Burglars Alarm; Stephen Stewart, Philadelphia, Pennsylvania.

Claim—The combination of the several parts, arranged to operate as set forth.

145. Washing Machine; Wm. A. Suddith and John F. Suddith, Charlestown, Virginia.

Claim—The hinged part of cylinder, as set forth.

146. Sewing Machines; George S. Tapley, Bristol, Connecticut.

Claim—The movable cup and its appendages, for griping and automatically releasing the shuttle at intervals, as specified. Also, the construction and arrangement of the feed apparatus, set forth.

147. Machines for Washing and Separating Ores after being Pulverized; Horace Trumbull, Jersey City, New Jersey.

Claim—The application to a rotary buddle or table, such as described, of vibrating brushes, when the same are arranged and operated as specified.

148. Elevators or Hoisting Apparatus for Hotels, &c.; Otis Tufts, Boston, Massachusetts.

Claim—1st, For the purposes of elevating, the combination of the screw and the passenger car or platform. 2d, The construction of a screw for elevating, having stays or bearers at intervals, attached to the wall of a building or any fixed adjacent structure. 3d, The construction of a nut with the slot or opening in the back or side to enable it to pass by the bearings or stays before referred to, and as described. 4th, Constructing a nut or carriage with wheels or rollers running upon the thread of the screw, as described. 5th, Controlling the descending motion of elevators or hoisting apparatus by means of fluid retarders, constructed as described. 6th, Regulating the action of fluid retarders by means of a fly-ball governor, or its equivalents. 7th, The construction, arrangement, and operation of passenger cars of an elevator or hoisting apparatus, as described: that is, providing the platform with side walls and doors or gates, said doors or gates being combined with suitable mechanism arranged in relation to stationary cams or projections on the gallery floors, or any contiguous parts of the building, so as to open and close automatically, in the manner set forth. 8th, Opening and closing the doors of the galleries or landings automatically, by means of cams or projections on the car, through a system of compound or multiplying levers, arranged as described. 9th, Fastening and unfastening automatically the doors or gates of the car, by spring latches, or their equivalents, operated by cams or projections upon the gallery floors or adjacent walls of the building. 10th, Fastening and unfastening automatically the doors or gates of the galleries or landings by spring latches, or their equivalents, operated by cams or projections upon the car. 11th, The arrester, in combination with the fluid retarders, for the objects and purposes set forth. 12th, Passing the shipping rods and the cord or rod that operates the friction brake through the car or platform, for the purposes set forth.

149. Dumping Wagons; William B. Twiford, Chincoteauque, Virginia.

Claim—The three-sided, four-wheel, open frame, stationary crank axle, and long wagon body, arranged in the manner described.

150. Spring Bed-bottom; Felix Tylee, Cleveland, Ohio.

Claim—1st, The central support, constructed in the manner described. 2d, The combination and arrangement of upper slat, pin, supports, with central support, spring, and blocks, arranged as described.

151. Machinery for Sowing Fertilizers; Lorenzo Tyler, Havana, New York.

Claim—The arrangement of the frame, hopper, partition, adjustable slide, m, valve, cylinder, concave, adjustable slide, j, and flexible clasps, constructed as set forth.

152. Hose Coupling; George H. Van Vleck and Horace Tupper, Buffalo, New York.

Claim—The arrangement on the thimble of the head with two or more screw threads, having its upper end turned down, as described, and being provided with a projecting rim, to operate in combination with the thimble and with the nut.

153. Cultivators; Amsey Warren, Westport, Connecticut.

Claim—The parting or deflecting bar, hoes or shares, and rake, when applied to a suitable frame provided with wheels, arranged and combined to operate as set forth.

154. Knitting Machines; J. F. Waterhouse, Germantown, Pennsylvania.

Claim—1st, The application of a drum, or its equivalent, with detachable pegs, to operate a series of independent thread guides having independent springs. 2d, The striker, or its equivalent, arranged in respect to the thread guides, and operating so as to control such of the thread guides as are not under the control of any of the pegs in the drum. 3d, Moving the pegged drum, or its equivalent, at intervals first in one direction and then in another, by means of the revolving disc, and its two inclined projections, in combination with the ratchet wheel. 4th, Imparting a combined lateral and vertical reciprocating motion to the needle bars by means of the devices described.

155. Machine for Receiving and Piling Paper; J. A. Wilkinson, Brooklyn, New York.

Claim—1st, The accelerating bands and roller, arranged to project the sheets of paper successively over each other as they subside in the air, and in combination with the foregoing parts, I claim the endless apron receiving such sheets. 2d, The retarding bands, in combination with the delivering bands, for the purposes specified.

156. Rotary Presses; J. A. Wilkinson, Brooklyn, New York.

Claim—1st, The curved demi-grab with the sliding clamp and lip, for the purposes specified. 2d, The curved compositors' shield, for the purposes specified. 3d, The arrangement of the proof cylinder and rollers for inking the type on the proof cylinder. 4th, The plate and roller, for giving pressure in taking a proof from the types on the cylinder. 5th, The horizontal gudgeon and binding screw to secure the proof cylinder, and facilitate the correcting of the types. 6th, The movable clamping segments at the heads of the type or proof cylinder to secure the types in place, and also allow for the removal of portions thereof. 7th, Revolving the type cylinders in a trough containing alkaline, or other suitable solution for washing the types. 8th, The apron for leading the paper into the press, and on which said paper lies while receiving the first impression against the cylinder, thereby said feeding apron becomes also the tympan sheet. 9th, A curved arch or bridge, over which the paper or fibrous material passes, to give direction thereto and prevent buckling or twisting. 10th, Corrugating or forming ribs on said curved bridge in diverging lines, so as to spread the paper widthways, as the same passes over the bridge. 11th, The auxiliary frame hinged into the main frame, and carrying the upper inking apparatus, by the elevating of which both type cylinders are exposed to view or can be lifted out of their place for varying the composition, or otherwise. 12th, The manner specified of throwing off both impressions by raising the auxiliary frame and lowering the impression roller. 13th, In a rotary printing press an endless tympan sheet, let off a sufficient distance, and so fitted that the offset from the ink of the first impression does not again reach the paper until removed or sufficiently dry, so as not to produce blurring or offset on the paper. 14th, The arrangement of the ink rollers, l′ l″ l‴ l⁗, in the manner and for the purposes set forth, whereby the rollers, l′ l″, act to supply the required amount of ink to the rollers, l‴ l⁗, that supply and work the ink on the cylinder, i or i′. 15th, The arrangement of the ink rollers, i′, and workers, in their adjustable bearings.

157. Stump Extractors; Eri Wills, Augusta, Maine.

Claim—The combination of the frame, tongue, and shaft, with the wheels, ratchet device, levers, and chain, arranged as set forth.

158. Roofs for Railroad Cars; A. P. Winslow, Cleveland, Ohio.

Claim—The plates, caps, and grooved rafters, arranged as described.

159. Preparation of Glycerine; J. F. Wisnewski, Cincinnati, Ohio.

Claim—The employment or use and introduction of the within named chemicals, in the relative quantities, manner, and combination described.

160. Skeleton Skirts; Edward F. Woodward, Brooklyn, New York.

Claim—The sectional extension skirt, combined and attached to the circular skirt, the whole being arranged in the manner set forth.

161. Composition of Matter for Ornamental Purposes; Albert H. Wright, Camden, New Jersey.

Claim—The composition of the matter described, consisting of the clay and sulphur with the emery, or its substitute, combined together as described.

162. Machine for Printing in Different Colors; John K. Wright, Philadelphia, Pennsylvania.

Claim—Hanging the rollers for printing separate colors and patterns on separate frames, and arranging the said frames so that they may be adjusted independently of each other on the rails.

163. Revolving Stairs; Nathan Ames, Saugus, Mass., Assignor to self and Ward McLean, City of N. York.

Claim—1st, Arranging steps or stairs upon an endless belt, or in any manner equivalent, and placing them over rollers so as to form a revolving flight of stairs, which may be used both as a common flight and as an elevator. 2d, The triangular arrangement of the stairs, whereby an endless flight is made to pass around three rollers. 3d, The double parallel arrangement, whereby ascending and descending flights are placed side by side. 4th, The use of auxiliary stationary steps or stairs, to operate in connexion with the revolving stairs. 5th, The employment or use of rods or slots, to operate in connexion with the slotted stairs.

164. Construction of Lightning-rods; L. S. Baldwin and Lucius Parks, Assignors to L. S. Baldwin, aforesaid, Leroy, New York.

Claim—The employment of a quadrangular tube of sheet metal with spiral-fluted sides, in combination with the straight central supporting rod.

165. Sewing Machines; R. Eickemeyer, Assignor to self and E. Underhill, Yonkers, New York.

Claim—1st, The combination of the angular supporting plate, with a needle applied and arranged to work through an opening in the angle of the said plate, and obliquely to both faces of the said plate, for the purpose of sewing obliquely through any substance supported in the angle of said plate. 2d, The combination of the angular supporting plate, the obliquely arranged needle, and a looper, applied and operating so as in its movements to follow the angle of said plate. 3d, The combination of the looper, constructed with a two-pronged hook, and having a triple movement with a stationary guide, applied and arranged relatively to the needle and angular supporting plate. 4th, The arrangement of the feeding dog and presser in a swinging frame, so applied, in combination with the angular supporting plate, as to provide for the introduction and removal of the hats to and from the machine. 5th, The slide, fitted to the angular plate opposite the feeding dog, with its face recessed behind the general surface of the plate, and having applied to it a spring by which it is operated, in combination with the feeding dog. 6th, The plate, 26, and its lips, in combination with the plate, F.

166. Portable Capstan and Crabs; Asahel Elmer, Assignor to Nathan Elmer and R. M. Pritchard, Shabbona Grove, Illinois.

Claim—So combining with the truck wheels or ground supports a capstan and crab, and a flexible rigging, as that the power of the team that draws the apparatus and works the capstan may be used for setting or anchoring the said crab and capstan, as well as to raise it up, reload it on to the truck, and transport it from place to place.

167. Bomb Lances; Isaac Goodspeed, Norwich, Connecticut, Assignor to self and Geo. A. Mansfield, Boston, Massachusetts.

Claim—1st, The compound wing described, consisting of the wing proper, the lever, and the pin and slot, arranged as set forth. 2d, The construction of a projectile having a prismatic shank with guiding wings of copper, or any thin substance, fixed to the exterior surfaces of the prism in such a manner as to expand in coincident plates.

168. Railroad Station Indicator; Louis Koch, Assignor to self and H. Forstrick, City of New York.

Claim—The apron or band, with the names of the streets or stations on the line of the route marked thereon, attached to and working on rollers or a revolving plate, or stationary plate and revolving index, when said apron, plate, or index are operated from the running gear of the car by suitable mechanism to give the same a continuous movement, and simultaneous with that of the car.

169. Double Clasp-hook for Watch-chains, &c.; Morris Pollak, Assignor to Morris Talkenan, Morris Pollak, and Solomon Weiner, Hoboken, New Jersey.

Claim—The S-shape or double clasp hook, formed by the discs and clasp-jaws on the centre pin that passes through the middle of the bent piece.

MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

Joule's Unit Verified. By J. P. Espy.

If we imagine an air-tight piston to move without friction in a cylinder 780 feet long, containing 780 cubic feet of air, at the temperature of zero, of half atmospheric density, to be condensed into half the space by a force of $7{\cdot}5 \times 144$ lbs., falling 390 feet, that is, through half the length of the cylinder, the air, by my experiments with the

double nephelescope, will be heated 76°. As this is effected by a weight of $7 \cdot 5 \times 144$ lbs., falling 390 feet, and as the air heated weighs 31·25 lbs., it may be used to test Joule's unit.

$7 \cdot 5 \times 144 \times 390$ is equal to the mechanical power of 421,200, which heats 31·25 lbs. 76° ; therefore, to heat one pound will require $\frac{421,200}{31 \cdot 25} = 13,478$, and 13,478 being divided by 76° gives 177·3 the number of feet which one pound must fall to heat a pound of air one degree, and from this unit of mechanical power for air, any one of the elements may be corrected, Joule's unit, for instance, if the specific caloric of air is accurately ascertained; or, if Joule's unit is correctly ascertained, then the specific caloric of air will be known, being divided by Joule's unit, 772 gives 17·42 the number of degrees one pound of water would be heated, and also the number of degrees one pound of air would be heated if air had the same specific caloric as water; but as the specific caloric of bodies is inversely as their power of being heated, divide 17·42 by 76° it will give 0·229 the specific caloric of air. Now, as my experiments with the double nephelescope give the specific caloric of air 0·218 and Regnault's 0·23, and as Joule's unit brings out an intermediate number, Joule's unit is probably correct, and certainly cannot be altered, till some of the elements from which I have confirmed it are altered by more careful experiments, or by more careful calculations from the same elements. I have never seen how Joule experimented in obtaining his unit, but it will be gratifying to that gentleman to learn that his result is confirmed in so simple a manner by my experiments, as it certainly is gratifying to me, to find that my law of cooling by the expansion of air is in perfect harmony with his most beautiful principle. I have not M. Regnault's determination of the specific caloric of air before me; but according to my recollection it is between 0·23 and 0·24, and my experiments with the double nephelescope make it 0·218. If we assume Joule's unit as accurate, using that as an element the specific caloric of air is exactly 0·229.

It follows also from Joule's principle that we may easily find the temperature of air condensed into double, treble, &c., densities, if we take Regnault's authority for granted, that the specific caloric of air is the same at all densities and temperatures.

For if we suppose a cylinder of air at half density with a temperature of zero condensed by pressure into half the space, it will be heated by the process 76°, and if it is condensed into one-fourth the space, it will require twice the force moving through one-and-a-half times the space, and will thus produce an increase of temperature of $3 \times 76°$; it will require four times the force moving through one and three-fourths the space if it is condensed into one-eighth the space, and that is $7 \times 76°$, the next duplication will increase the temperature to $15 \times 76°$, the next to $31 \times 76°$, and so that at the distance of 35 miles below the surface of the earth the air by its own pressure, supposing it doubled its density every three and a half miles, would be 1024 times as dense as at the surface of the earth, and 153,748° hot.

This calculation is made on the supposition that Regnault's experiments have proved that the specific caloric of air is the same for all temperatures and densities. According to my experiments with the double nephelescope, the specific caloric of air diminishes as the density increases; a double density giving $6\frac{1}{2}$ per cent. less specific caloric, the heat, therefore, if my experiments are correct, is much greater than the estimate above. Certain it is, when double density was used, the cold of expansion into double space was 81°, whilst with common air the cold was only 76°.

The specific caloric of steam may also be calculated from the mechanical unit of heat. For as a column of air 780 feet long of one square foot area contains 62·5 ℔s. in weight, the quantity of steam in pounds which is contained in an equal column can be calculated by taking $\frac{5}{8}$ of its weight, and diminishing that quantity in proportion to its temperature above zero. For example: at $\frac{1}{2}$ density the column of air at zero of the above size weighs 31·25 ℔s., $\frac{5}{8}$ of which is 19·54 ℔s., and this diminished by $\frac{180}{628}$ of the whole is 13·95 ℔s., which a column of steam at $\frac{1}{2}$ atmospheric pressure and 180 in temperature weighs.

Now, if the area of the end of the cylinder, 144 inches, is multiplied by 7·5 ℔s., which must fall 390 feet to produce double density in the steam, and thus raise its temperature 32°, it will make 10,880, and this multiplied by 390 makes 424,320, and this power heats 13·94 ℔s. of steam 32°; consequently, $\frac{424320}{13 \cdot 94}$ will be required to heat one pound 32°, but if this last number, $\frac{424320}{13 \cdot 94}$, be divided by Joule's unit, 772, it will give the number of degrees a pound of water would be heated by the process 39·255°, and as the specific caloric of bodies is inversely as their powers of being heated, if 39·255° be divided by 32°, it will give 1·223 the specific caloric of steam at atmospheric pressure and 212° temperature.

In like manner I have calculated the specific caloric of steam for the several densities and temperatures below.

The first column contains the pressures in atmospheres; the second the temperatures; the third, the number of pounds of steam in the column to be heated by the condensation; the fourth, the mechanical power required to produce the condensation; the fifth and last, the specific caloric of steam at the different densities.

Atmospheres.	Temperatures.	Pounds of steam heated.	Mechanical power.	Specific caloric.
$\frac{1}{2}$ to 1	212°	13·95	421,200	1·223
1 to 2	248·5°	26·52	842,400	1·067
2 to 4	293·4°	50·23	1,684,800	0·965
4 to 8	343·6°	94·40	3,369,600	0·916
inches.				
0·2 to 0·4	52°	0·2427	11,232	1·50

From this table, unless there is some miscalculation, it appears that the specific caloric of steam diminishes as the density increases, as that of air does.

There is in fact a diminution of 25 per cent. from one atmosphere

to eight in density or rather in tension, for with eight times the tension the density is only about 6·7 times greater.

It appears also from the principle in question that in condensing air the higher the initial temperature the greater will be the heat produced by condensation—so that if air should be used at 448° or 461°, according to Regnault, above zero, a condensation into half the space would heat it $2 \times 76°$, and so in proportion.

For the Journal of the Franklin Institute.

Japan; its Industry and Meteorology.

About two years ago, when the United States Steamship *Mississippi* was about to sail for China, the Chairman of our Committee on Meteorology, requested Mr. Joseph H. Warrington of the Engineer Corps on board that vessel, to transmit to the Institute any information on scientific or industrial subjects which he might obtain during his visit to the Asiatics. By a letter from Mr. Warrington, dated Simoda, Japan, March 16th, 1859, the committee have been placed in possession of the appended meteorological table, made from observations taken at that place by Townsend Harris, Esq., U. S. Consul-General. They are probably the first published observations of an American in that country.

The Report is preceded by a notice of the Japanese and their productions, from which we extract the following:

So much has been said of the capabilities of the Chinese, that I really expected to find them a very smart people, but I have been greatly disappointed; and except their shrewdness and cunning, I must say that they have not one redeeming quality, and are a disgusting people. Not so with the Japanese, they are a very intelligent race, and are vastly superior to the Chinese in every respect; they are very cleanly in their habits; never enter a house with their shoes on; and excel in every thing which they undertake. They make shot and shell —and when at Hakodadi I endeavored to get a hollow shot for the Institute, but could not. Their casting is perfect; I had several very fine specimens, but they were sent away with several other things in a mistake, and it is very doubtful if I ever obtain them again; one was a casting in copper of a stag, which is equal to any thing of the kind I have ever seen in any of our large establishments like Cornelius, Baker & Co., or Archer, Warner & Co. If we go to Nagasaki I will try to get some more—their lacquer ware has a world-wide reputation. I have endeavored to obtain a specimen of the liquid lacquer, but failed. They make very neat joints in all their work, and have succeeded very well in constructing one or two vessels of about 300 tons. Their money is principally silver and copper. The kobaug, valued at about seven dollars, is gold; the itzabu is silver, and is rectangular in shape; the half itzabu has some gold in it, I believe, although the specimen which I have looks more like being washed with a solution of copper than an alloy of gold and silver. The copper coins are cash, 1475 of which are worth one dollar; the itzabu is valued at about 33

cents. The late treaty fixes their value by this standard;—"silver money will be taken weight for weight, with a deduction of six per cent. for expense of re-coinage."

The Dutch government have constructed a large machine shop at Nagasaki, where the Japanese receive instruction in the fabrication and management of steam engines. The shop is well fitted up with good tools, and some of the work I have seen, done by one of the apprentices, would do credit to a journeyman in the States.

They are very great adepts in the art of casting; and I saw a small 12 lb. howitzer in the lathe, which was beautifully cast. They have a small steamer which they bought from the Dutch government, and which runs up to Yeddo; the apprentices take turns in going aboard the steamer; but they cannot stand the heat. The profession of engineering is held in very high esteem by all the people, and they pay more respect to an engineer than they do to any of the other officers. If any of us (our corps,) are introduced to one Japanese officer by another, he tells him that we are "officer machinist," and we are sure of the greatest courtesy.

Meteorological Observations made at the United States Consulate-General, Simoda, Japan. By TOWNSEND HARRIS, Esq., U. S. C. G.

		THERMOMETER.				WINDS.					WEATHER.			
YEAR.	MONTH.	Highest.	Lowest.	Mean.	Extreme daily range.	N. & E.	N. & W.	S. & E.	S. & W.	Calm.	Rain.	Showers.	Cloudy.	Fine.
1856.	October,	77	51	64·3	15	17	4	5	5	4	3	5	5	18
"	November,	69	46	57·4	14	12	4		9	5	2	1	2	25
"	December,	69	36	48·9	17		16	1	13	1		4		27
1857.	January,	54	33	45·1	15	75	20			4	2	1	3	25
"	February,	63	32	45·5	19	9	13		5	1	4	4	4	16
"	March,	63	38	51·6	13	11	6	3	7	4	5	4	2	20
"	April,	67	43	57·2	14	6	5	3	13	3	4	2	3	21
"	May,	73	55	64·1	14	15	3	2	9	2	11	2	6	12
"	June,	80	59	70·8	10	6	1	4	16	3	7	6	3	14
"	July,	84	66	76·1	7	5	2	1	21	2	5	5	3	18
"	August,	87	67	77·7	10	12			14	5	4	4		23
"	September	85	62	75·4	12	11	3		11	5	4	3	2	21
For 12 months.		87	32	61 17		107	77	19	123	39	51	41	33	240

Remarks.—The thermometer was noted at 8 A. M.; noon, 4 and 10 P. M.

Winds from the cardinal points are put back one point, *i. e.*, north is put down northerly and westerly, and south southerly and easterly, &c.

The *prevailing* wind of the day only is noted.

Warmest day, August 7th, mean 83·25°.

Coldest day, February 2d, mean 36·25°.

February 11th, 4 A. M., thermometer stood at 28°.

First white frost, December 12th.

Ice made on eight nights.

Snow fell twice.

Earthquakes, thirty-four, all light.

Only one severe gale of wind.

Thickest ice 1¼ inches.

Ice or snow melts before 2 P. M.

Warmest month, August, mean 77·7°.

Coldest month, January, mean 45·1°.

*On the Practical Bearing of the Theory of Electricity in Submarine Telegraphy, the Electrical Difficulties in Long Circuits, and the Conditions requisite in a Cable to insure rapid and certain communication.** By S. ALFRED VARLEY, Assoc. Inst. C. E.

(Continued from page 206.)

Mr. CROMWELL VARLEY said he could answer some of the questions put by Professor Tyndall. He had consistently recommended to the Electric and International Telegraph Company the use of wires of large diameter, for the last twelve years, as the only means of obviating the difficulties experienced on long circuits in wet weather from leakage, which, with the earlier forms of insulator used, was very great. Since the introduction of submerged wires he had pointed out the advantage that would be gained in such circuits of great length by the use of copper wire of large sectional area. On his recommendation the directors of the above-named company had tried both of these experiments on a large scale. They had erected iron wires of No. 3 wire-gauge on the London and North Western Railway, on the Great Western, and the London and North Western Railways, instead of the usual size (No. 8.) The results were such that he had no doubt they would never again, for long circuits (viz: of over 200 miles in length), erect other than thick wires. They had tried thick wire under the sea in their new cable connecting England with Holland. This cable contained four conductors of No. 13 instead of No. 16 wire, and although, for reasons explained further on, the relative speed of this compared with that of the former size was not so great, yet there was a very decided gain in rapidity, together with much stronger and much more uniform and reliable currents. These wires were connected both in England and Holland with a considerable length of overground wire, which latter was much affected by changes of the weather, and the gain in unfavorable weather from using the larger wire was, as predicted, very considerable. He was very much surprised to find Mr. C. V. Walker adhering to, and supporting, views which other well-known electricians had put forward, viz: that increasing the sectional area of the wire did not increase the rapidity of the transmission of electric signals. The experiment, however, had been lately tried in the new Dutch cable, and although the relative speed was not exactly known because there were many difficulties in the way, yet the fact was established that increasing the sectional area had greatly increased the speed. He had tried to determine the effects of induction, &c., on the speed of the electric wave; not only had the inductive effect to be taken into consideration, but also the absorption of electricity by the surfaces of the dielectric, and these influences were ever changing by heat and by the charging of the wire to such an extent that approximate results only were obtainable, which, however, were sufficiently near for all practical purposes. The absorption of electricity by the surface of the dielectric required time, and therefore cables of such length and dimensions as would only work slowly, suffered more from this absorption than shorter and

* From the Jour. of the Society of Arts, No. 332.

quicker ones. The retardation of the wave in a cable was caused by the lateral induction absorbing part of the electricity intended to give the signal through the line, and until this charge approached the maximum the current at the distant end would be weak. If two cables were made, the one with an iron and the other with a copper conducting wire inside the gutta percha, all other things remaining the same, the former would have as much induction as the latter, because this had reference only to the surfaces of the dielectric. As the iron wire would only conduct at one-quarter the speed of the copper, it would require, with a given electro-motive force, four times as long to transmit a given current. The electricity would require, in the case of the iron wire cable, four times as long to charge the gutta percha, by lateral induction, as the copper wire would, consequently such a cable would have only one-quarter the speed of the other. Were it possible to compress twice as much copper into the same diameter, and so double the conducting power without increasing the inductive surfaces, the speed would be immediately doubled. This was not possible, and the effect could only be obtained by increasing the sectional area of the wire; increasing this four times, doubled the interior surface of the gutta percha, which was the chief inductive surface, and, leaving out of consideration for a moment the exterior surface, the conducting power would be quadrupled while the induction was only doubled; hence there would be a gain in speed of from 1 to 2. But there was more still than this gained; first, suppose the diameter of the small wire to be unity, and the thickness of the gutta percha covering also unity, the exterior surface of the gutta percha would be 3, and the combined surfaces of the gutta percha would be $3 + 1 = 4$. In the second case, where the copper wire was doubled in diameter, and quadrupled in weight, there would be two for the inner surface of the gutta percha, and four only for the outer surface, instead of six—collectively, six instead of eight. Hence doubling the diameter more than doubled the speed. The third gain from the large wire was, that, having a higher speed, there was less time for the absorption of electricity, and, consequently, the disturbance and retardation from this cause were less. Having a current of four times the power entering the cable, and the leakage being less in proportion to it, the current received at the distant end would be more than four times as powerful, and much more regular; the apparatus would be less frequently interrupted for adjustment, and would, consequently, work without intermission for a much longer period than the smaller wire. Mr. Walker had alluded to the Atlantic cable, and stated, in proof of the sufficiency of the diameter of the copper wire, the fact that a single element of water battery gave a current perceptible at the other end. He (Mr. Varley) contended that this proved nothing as to its ability to transmit intelligible signals. In an Atlantic cable we must have not only a wire capable of giving currents and signals, but of giving such currents and signals as should overcome the friction and inertia of the apparatus used for indicating them; these currents must be so powerful and constant, that, when the philosopher had left the cable to the ordinary manipu-

lator, the currents should not fluctuate so much as to interrupt the intelligibility of the communications. The current must have such force, that the varying friction of the apparatus should not materially influence the recording of signals. In the Atlantic experiment these difficulties were overcome to a great extent by a most ingenious little instrument—Professor Thompson's reflecting galvanometer. In this instrument the only friction was that of a single thread from a silk cocoon, supporting a very short magnetic needle, only $\frac{1}{3}$ of an inch in length, which carried a small mirror made so light as to weigh only a grain or two. The mirror reflected back through a lens a ray of light, and thus without impeding its free action, or adding to its friction, a long but imponderable arm was added to the needle to magnify its motion. This little needle was rendered more or less nearly astatic by placing a large magnet under it to neutralize the earth's magnetism, and thus a nearly astatic instrument, sufficiently rapid in action from its small dimensions, sufficiently sensitive by its long imponderable arm (or ray of light), sufficiently free from friction by being suspended from a filament of silk, was obtained, and by it the faint signals through the cable were rendered visible. These signals were watched by a clerk, and recorded by hand on a Bain's printing machine. He (Mr. Cromwell Varley) felt that sufficient credit had not been given to Professor Thompson for this instrument, without which the Atlantic cable would never have transmitted a single message, and the world would not have had this great experiment to guide them, as there would have been no means of ascertaining whether the cable had reached the bottom of the Atlantic without parting. Such an instrument, however, was not calculated to meet the requirements of a commercial undertaking, because the reflected spot of light was difficult to follow with the eye for any length of time, and was often recorded by the manipulator incorrectly. The current must have sufficient force to record itself. With regard to the insulating properties of gutta percha, when pure and free from moisture he had found it to rank among the best dielectrics, but this was not the condition of the gutta percha used on cables, which appeared to be porous and to contain moisture. When the gutta percha was sufficiently heated to free it from this, there was great danger of altering its character, and rendering it liable to become brittle and to crack. In the Atlantic cable, even before it had been put under water, the loss of current by leakage was so considerable that less than one-third of the original current only reached the distant end. Were the loss constant in quantity it would not so much matter, but wherever the current escaped through moisture, there was polarization and ever-varying resistance at the leaky spot. As an example, he would quote one of many similar cases that had come under his notice. In one of the London and Liverpool wires, there was a defect in the Kilsby tunnel, caused by a filament of wood in the gutta percha, which was wet at this spot. This leak gradually got worse and worse, and sometimes offered a resistance equal to ten miles of the line composing the circuit, and at other times, especially after the continuous passage of a positive current for some length of time, it offered a resistance

equal to more than a thousand miles of the circuit. The fault was situated nearly half way, roughly speaking, 100 miles from the end, and when it offered a resistance of only 10 miles, $\frac{1}{11}$ only of the current from London reached Liverpool, assuming the rest of the line perfectly insulated. When the fault from polarization, &c., offered 1000 miles resistance, the current which reached Liverpool was $\frac{10}{11}$ of that which left London; these fluctuations sometimes took place in a second of time. The formulæ for such a case was $e = \frac{E\,l}{l + y}$, where e was the current received at the distant end, E the current leaving the original station (London), l the resistance of the leak, and y the resistance of the line between the leak and the receiving station. Now in the former case, the current was amply powerful enough to work the instruments, and no inconvenience would have been experienced had the fault remained constant, but, on the contrary, it was always varying in force, and to such an extent that it was impossible to work the line though only 200 miles in length. Thus it would be seen that, leaving out of the question induction, and its consequent diminution of speed, a conductor of sufficient size must be had to cause these leaks to bear only a small proportion to the current transmitted, in order that the received signals might be sufficiently regular and equal in force to record themselves with certainty and ease. Unless these conditions were attended to, the cable, as a commercial undertaking, would inevitably fail. With regard to the rapidity of conduction of the electric current, his opinion was that the current began to flow from the distant end *immediately* after the near end was connected to the battery. Electricity showed no signs of compressibility or elasticity, and was without inertia. Suppose, for a moment, that a cable was divided into several portions, each of which was without appreciable resistance, but separated from the next portion by a given resistance, the first portion, on coming in contact with the battery, would be instantly charged, and as instantly would begin charging the next portion, but to a lower degree than itself; this second portion as instantly charged the third portion, to, of course, a still lower degree; and this the next, and so on to the end. By careful reasoning on the known laws of electricity he had come to the conclusion that the current began to flow out of the distant end instantly, but so feebly at first that the most delicate instruments failed to show it. Before concluding, he would draw attention to the unhappily chosen terms "quantity" and "intensity." What in England was generally understood by "quantity," was in Germany termed intensity or I. What in England was termed "intensity" or tension, was the electro-motive force; in other words, the $I = \frac{E}{R}$, where I represented the power of the current to decompose a given quantity of an electrolyte, E the electro-motive force of the current, and R the resistance of the circuit. These terms had unfortunately led many into error, more especially the word "intensity."

Mr. C. W. Siemens agreed with much that had been said in the paper. He was decidedly in favor of a large conductor of the very best specific conducting power; and had maintained from the first that the conductor of the Atlantic cable was totally inadequate. When he read a paper last year before this Society, he had expressed the laws by which the proportion of an electric cable should be regulated for a given length by a simple formula; and he thought that a mathematical expression properly explained was preferable to an explanation in words only, even for a popular assembly like the present, because it combined all the elements to be taken into consideration. He did not agree with Mr. Varley that an electric wave on entering a submerged cable at one end presented itself, in however slight a degree, instantaneously at the other. The laws of induction and conduction, as he understood them, were directly opposed to such an assumption; and in his own experience he had certainly never observed any indication of it. The line expressing the relative amount of charge at different points of the electric wave in the conductor, was expressed not by a dynamical curve, as Mr. Varley had shown it, but by a straight line, terminating abruptly upon the horizontal line which represented the conductor. Another portion of the paper dealt with the complete metallic circuit in submarine conductors, which it was generally understood had been first proposed by his (Mr. Siemens') brother. Mr. Siemens could not agree with the views expressed by Mr. Varley, and by several others who had lately written in the scientific journals upon this subject. Some of them seemed to lose sight entirely of the most essential condition, namely, that the two conductors were to be embedded in the same insulating medium. His brother had never for a moment assumed, as seemed to be supposed, that lateral induction between the two conductors constituting the circuit would be obviated. On the contrary, it would be rather increased on account of the greater resistance of the metallic circuit. But it was maintained that the charge between the conductors and the larger surface of the sheathing would be nearly entirely obviated; that the working of one metallic circuit in a multiple cable (which his brother had chiefly in view) would not disturb the electrical equilibrium of the other conductors; that the losses by leakage would be reduced, enabling him to reduce also the area of the conductor, and thereby also the lateral induction between them; that the metallic circuit was not affected by magnetic storms; and, finally, that considerable advantage could be obtained by the mutual acceleration of the positive and negative currents by Volta induction. So long as a single conductor could satisfy the public demand for messages, the advantages of a metallic return wire would probably not warrant the additional expense, but wherever several conductors became necessary, the advantage of working through metallic circuits would be very great. Mr. Varley's illustration of surrounding the one conductor by the other (in the form of a tube) did not meet the case, because the tubular conductor possessed the very condition which it was intended to avoid, namely, an extended inductive surface both against the inner conductor and the outer sheath-

ing. Mr. Siemens had only one other point to remark upon, and that was of an historical nature. Mr. Varley had stated that Mr. W. Siemens had first employed gutta percha coated wires in Prussia in 1850, where he had observed the phenomena of induction also. It was, however, in 1847 when the first gutta percha coated line wire was laid down successfully near Berlin; and he (Mr. Siemens) exhibited specimens of it, and explained the phenomena of charge which had been observed, before this Society in 1848. He might also observe that the statements which had been circulated, that the gutta percha coated wire, as first prepared in Prussia, had proved an entire failure, were very unfair towards his brother. These wires had been coated in the same manner as they were at the present day, although it must be admitted that the quality of the gutta percha employed was very inferior. These lines had, however, done good service for four or five years, when they began to fail; some of them had, however, lasted much longer, and some—covered with lead—were actually in use to the present day. He did not think that a much more favorable result had since been obtained elsewhere.

Mr. Leonard Wray said he would make but a few brief remarks upon some of the points under discussion. In the first place he considered that the paper read by Mr. Varley was a very valuable and instructive one, for which all present must feel indebted to him. Let the ideas brought before the Society that evening be designated as mere conjectures, or theories, or what not, still he ventured to differ from Professor Tyndall's opinion, that Mr. Varley should have confined them to his own breast until he had fully tested and proved them practically, inasmuch as Mr. Varley, by giving publicity to them before that Society had, in fact, laid them before the whole world of science, and the result would be, that instead of these ideas remaining stored up in his own mind alone, to be worked out solely by his own individual energies, there would now be many, very many, minds brought to bear upon them, and to assist in reducing them the more speedily to the test of practical experiment. The next point he would remark upon was the best diameter for the conductors of electric telegraph cables, a subject which was so very much discussed, and so very much disputed, that he would only present to the notice of the Society one very singular and significant fact bearing upon the question. When telegraph wires were first introduced into India, Sir W. O'Shaughnessy and his staff were sadly annoyed by the continual breakings of their wires, caused by very large birds alighting upon them. To remedy this nuisance that gentleman employed very thick, strong wires which these birds could not injure; and this great increase in the size of the wires brought out the remarkable fact that no insulation whatever was necessary at the posts around which they were simply wound. This deserved, he thought, to be recorded in such a discussion as the present. The third and last subject to which he (Mr. Wray) would refer, was that of insulation. Now, the substance almost universally used as an insulating material was gutta percha; but they were told, and many of them knew it as a fact, that gutta percha

absorbed no inconsiderable quantity of electricity; indeed, that it became, to a certain extent, saturated with it. Such being the case, it must be evident that gutta percha was by no means a perfect insulator, for he held it as an axiom, that no really good and perfect insulator would absorb electricity. The greater the quantity of electricity absorbed by the insulating material used, the greater would be the retardation of the current. Hitherto, then, a substance had been employed which was very far from perfect, and all calculations had been based upon its known insulating properties; but if they had a superior —a very much more perfect insulating material—would it not be possible to construct cables with a far less quantity of that material than gutta percha? He thought so, and he moreover believed that such an insulating material as he had spoken of, would, very probably, be soon discovered.

Mr. S. Alfred Varley said he had but little to reply to, as no attempt had been made to refute the views he had brought forward. He was unable to follow Mr. C. V. Walker throughout, and he did not clearly see the direction in which his views tended. Mr. Walker appeared to object to the statement made, that there was a difference between an ordinary Leyden jar and a submarine circuit; yet he admitted that the conductor united the inner and outer coatings of a submarine wire when regarded as a Leyden arrangement, and that the resistance it opposed was the only thing which prevented the free flow from the one to the other; now he (Mr. Varley) thought this was a most important admission, for upon it depended the reason why a large wire conducted more rapidly than a smaller one, and this was no longer a theory, but an ascertained fact. If there were no difference between a submarine wire and an ordinary Leyden jar, and if a submarine circuit had to be charged statically to saturation before signals passed, as was stated to be the case by the advocates of the small wire system, then it would be clear that as the greater the sectional area, the larger the Leyden arrangement would be, there would be more retardations with larger conductors, as more electricity would be required to charge them. He maintained that, in practice, a submarine circuit was not charged to saturation; the degree to which it was charged statically depended upon the relative balance between the conditions which favored induction and conduction; if the conditions, as had been stated in the paper, favored conduction, there would be less statical charge, and a greater proportion of the electrical impulse would be directed forward, and signals would be obtained more quickly. He fully concurred in all the views expressed by Professor Tyndall, and quite agreed with him as to the desirableness of searching for facts with actual submarine circuits of varying dimensions; but when these were not at command, he thought we should not wait for such favorable conditions for experimenting, but should endeavor to obtain the best substitute we could. Moreover, if it were possible to obtain all the conditions which submarine circuits presented in our own private laboratories, this would be a positive advantage, for the whole being under immediate command, and not disturbed in any way by

atmospheric causes, more or less defective insulation, or other disturbing influences always occurring more or less in practice, we should be enabled to trace out principles more clearly and have fewer sources of error to eliminate. Mr. Siemens, when considering the question of the complete metallic circuit *versus* the earth for one-half of it, objected to the fairness of the diagram in which one of the conductors was made into a tube. This diagram was introduced, as was stated in the paper, as an exaggeration, simply to show the fallacy of the principle; and although, as was stated by Mr. Siemens, the wires would not, when side by side, present as much surface to induction as an ordinary circuit, yet it must be borne in mind that there would be just twice the resistance of that which would be opposed when the earth was employed for one-half of the circuit, and this would more than counterbalance the lessened surface exposed to induction. He agreed generally with the remarks made by Mr. Wray. There was no doubt that with large conductors imperfect insulation was less felt, but the result in Sir W. O'Shaughnessy's case was probably not altogether due to the size of the conductor, for it must be remembered that the climate was very hot and dry. As a practical fact, he (Mr. Varley) would state that when in the Crimea they never obtained what telegraphists termed a "perfect earth." In the submarine circuit between Varna and Constantinople, contact with the earth was made by connecting a wire to the iron sheathing of a piece of the cable, more than a quarter of a mile in length, which was buried in the earth, and passed through the British Embassy grounds, yet, notwithstanding this extensive surface, in hot weather he found the earth, to use a telegraphic expression, very far from "perfect," and he remedied this by carrying a wire out into the Bosphorus.

The CHAIRMAN said, before proposing the usual vote of thanks, he would express his opinion of the result of the discussion that evening. They had advanced very little in practical knowledge since the failure of last year with the Atlantic cable; but the proper way of doing so was to follow the course pointed out by Professor Tyndall. At the same time he thought it was well that theories should be advanced with a view to set men thinking; but the professor no doubt meant to pay Mr. Varley the compliment that his knowledge of this matter would be better applied to the practice than the theory of the subject. But Mr. Varley was, in fact, doing what had been asked of him; and it was only owing to some delay in the completion of an elaborate instrument that he was not able to lay before them the results of actual experiment. The *experimentum crucis* was what they really wanted; wires of different conducting powers tested against each other, and the results ascertained by the best class of instruments, and, he would add, by a variety of experimenters. He found that electricians still remained true to their colors, in the absence of positive results one way or the other. His friend Mr. Walker still adhered to the small wire, whilst others appeared as the consistent advocates of a large wire as the best conducting medium. In this country, such opportunities were presented for experiment upon a large scale, that they

had nothing to fear from theory; and he hoped such experiments would be made as would solve many of the points upon which so much diversity of opinion now prevailed. He would now propose a vote of thanks to Mr. Varley for his able and interesting paper.

For the Journal of the Franklin Institute.

Particulars and Performance of the U. S. Steamer Wyoming.

The above named steam sloop, the first finished of seven ordered to be built by Congress in 1857–'58, returned on the 6th of Sept., 1859, from a trial trip of two weeks duration, of which one week was passed at Charleston, to which port she went by order of the Honorable Secretary of the Navy.

The *Wyoming's* hull was constructed at the Philadelphia Navy Yard, under the supervision of Francis Grice, Esq., by whom she was designed.

It has the following dimensions, viz:—

Hull.—

Length, billet to taffrail,		232 feet	9 inches.	
" on gun deck,		209 "	9 "	
" between perpendiculars,		198 "	6 "	
" of keel from back part of forward stern post,		188 "		
Width of beam molded,		32 "	2 "	
" " extreme,		33 "		
Depth of hold,		15 "	10 "	
" forward and aft of machinery space of lower hold under berth deck,		8 "	10 "	
Space allotted to machinery, comprised between two wooden water-tight bulkheads,		50 "	8 "	
Draft of water loaded, forward,		12 "	7 "	
" " aft,		13 "	2 "	
Displacement,	1475 tons.			
Area of immersed midship section,	391 sq. feet.			
Tonnage (custom-house measurement),	997 tons.			

Carries three months provisions, six months stores.

Spars and Sails.—Barque rig.—

Foremast above deck,		54 feet.
Main mast "		59 "
Mizen " "		53 "
Fore and main topmast,		36 "
Mizen "		35 "
Bowsprit outboard,		26 "
Jibboom,		25 "
Spanker boom,		50 "
Area of sails,	9705 sq. feet.	

Armament.—

2 11-inch pivot guns and carriages.
4 32-inch guns " "

Weight of guns in all,	40 tons.
" ammunition for guns,	30 "

The machinery was designed and constructed by Messrs. Merrick

& Sons, of Philadelphia. The requirements of the Navy Department for the vessels of this class were stringent, and calculated to draw out the best talent of the country in their execution. The result of the trial of this ship shows that Mr. Toucey's efforts to increase the efficiency and economy of the United States Navy, have been effectual.

The guarantees required of the contractors for this and the other vessels of the same class, were briefly as follows:—

1st, That the weight of all the machinery, spares, tools, water in the boilers, and coal for five days maximum steaming, should not exceed 406 tons (of 2240 pounds).

2d, That the engines should be capable of making 80 turns per minute.

3d, That the machinery should be capable of developing 1000 horse power by indicator.

4th, That the consumption of coal per indicated horse power per hour, should not exceed a certain rate (in the case of the *Wyoming* 2·9 pounds).

All the ships were to be provided with a surface condenser.

The principal dimensions of the machinery for this ship are given below.

Engines.—Two horizontal double piston rod, direct-acting engines.—

Cylinders, diameter,		4 feet 2 inches.
" stroke of piston,		2 " 6 "
Crank shaft, diameter,		11½ "
Shafting, "		10 "
Fresh water air-pumps (two) diameter, each,		11 "
" " stroke,		2 " 6 "
Salt water circulating pumps (two) diameter,		10 "
" " " stroke,		2 " 6 "
Condenser—surface,	3000 sq. ft.	
Number of tubes (brass),	3000.	
Diameter "		0⅝ "
Length "		6 "

Having its tubes secured at both ends in tube sheets, one of which is fast, the other free to move with the expansion of the tubes.

The engines have slide valves, and independent cut-off valves sliding within and upon them, which may be adjusted at pleasure, while in motion, to cut off between 6 and 21 inches from commencement of stroke. They are driven by links from the cross-heads.

The crank shaft bearings are four in number: the after one 24 ins. long, the two middle ones 18 inches each, and the forward one 16 ins. They are in four pieces each, chambered to allow of the passage of water around without touching the wearing surfaces. Each piece, or all, may be removed without moving the crank shaft. The upper and lower pieces are not keyed up, but simply slipped, when raised or lowered to overcome the wear. The cap-bolts being horizontal, take the direct strain. The eccentrics and link motions are between the engines.

The propeller shaft is covered with brass where it passes through the deadwood, and revolves in lignum-vitæ bearing bushes, 7 feet 6 inches in total length.

The thrust is taken either on spherical steel rollers, or on the usual collar thrust, as may be preferred.

The engines drive the line of shafting by a clutch coupling having four steel faces. This may be disengaged in a moment when the ship is put under sail alone.

Space occupied by engines in length of ship, including passage ways 19 inches wide, both forward and aft,		15 feet 11 inches.

BOILERS.—Three of Martin's vertical tubular, having iron shells and brass tubes, placed two on one side of the ship (of which one consists of a single furnace, and is used as an auxiliary or "donkey"), and one on the other side, facing each other, with a fore and aft fire-room between them.

Length occupied in the ship,		24 feet 9 inches.
Breadth, " " including fire-room,		29 "
Depth, exclusive of steam drum,		10 " 2 "
" inclusive " 10 feet diameter,		14 " 2 "
Fire-room, length,		24 " 9 "
" breadth,		8 " 6 "
Surface in all boilers,	7890 sq. ft.	
Tubes, number "	4280.	
" length,		2 " 7¼ "
" external diameter,		2 "
Grates, number,	14.	
" breadth (except of donkey, which is 2 feet 6 ins.),		3 "
" length,		5 " 10 "
" area,	242 sq. ft.	
Smoke-pipe—one telescopic in two sections.		
" height, when up, above deck,		40 "
" " " grate,		52 "
" diameter,		6 " 10 "
" area,	36·7 sq. ft.	
Least area between tubes in all boilers,	39·65 "	

PROPELLER.—One brass true screw.—

Number of blades,	4.	
Diameter of screw,		12 feet 3 inches.
Pitch "		19 "
Length "		2 " 6 "
Weight of all machinery, spares, &c., and water in the boilers,	227·6 tons.	

COAL BUNKERS—Extending over the boilers, partly over the engines, and between the boilers and engines, leaving only a passage way, in which are placed the hand pump and donkey pump.

CONTENTS—163 tons anthracite—also, forward of the machinery space is an extra bunk carrying 72 tons—making 235 tons in all.

Performance.

The following is an abstract of each half day's performance during the trip out to Charleston and back. On the outward passage the engines were run at easy speed. That passage, from the Capes of the Delaware to Charleston bar, was made against a head wind and moderate head sea, in 59 hours 40 minutes running time; average speed by Massey's patent log, 9·3 knots per hour the whole distance. On the homeward passage the wind was favorable, but light, for 24 hours; the rest of the time ahead, increasing to a moderate gale for the last 10 hours before reaching the Capes. Time, 46 hours 45 minutes from the Bar to Capes of the Delaware; average speed 10·8 knots. Highest speed under steam alone for one hour, 11·5 knots. Highest for six consecutive hours, 11 knots.

Outward Trip.

Hours.		Revols. per minute.	Steam pounds.	Vacuum inches.	Cut-off inches.	Throttle, per cent. open.	Indicated horse power.	Temp. feed water.	Saturati'n in boilers, 1·32 unity.	Coal per hour.	Coal per H. P. per hour.	
Aug. 25,	11	45·3	15·81	22·45	13·3	·25	302·3	83°	0·00	1089	3·60	Mod. head sea.
" 26,	12	54·0	14·58	23·30	14·3	·29	370·4	84°	0·00	1280	3·45	" " wind & sea.
	12	63·4	16·10	23·50	9·0	·74	503·1	90°	0·25	1415	2·81	" head swell lig't H.B.
" 27,	12	63·0	17·60	23·70	8·5	·62	466·8	87°	0·62	1514	3·21	" " sea fresh H.B.
	12	64·1	16·85	23·46	8·5	·79	504·8	89°	0·93	1560	3 09	" " "
" 28,	1	66·6	17·00	23·00	8·5	·80	568·7	88°	1·12	1500	2·60	" " "
Mean.		58·2	16 20	23·29	10·62	·60	433·9	86°	0·37	1378	3·17	
Homeward Trip.												
Sept. 3,	10	69·0	17·50	22·33	10·45	·85	619·0	86°	0·80	1740	2·81	Fresh B. star'd. beam.
" 4,	12	71·7	17·42	22·90	11·25	1·00	709·3	89°	1·00	1680	2·37	Sail set, very light B.
	12	73·3	17·33	22·00	10·04	·77	621·7	86°	1·06	1780	3·02	" "
" 5,	12	69·8	17·25	20·50	10 60	·75	581·5	88°	1·12	1820	3·09	Light B ahead, increas'g to head wind & sea.
	12	72·5	14·83	20·50	11·50	1·00	618·7	83°	1·20	1710	2·77	Delaware Bay and
" 6,	2	74·5	18·25	23·50	11 50	1·00	793·0	90°	1·18	1760	2·22	River.
Means.		71·45	16·90	21·68	10·78	·88	637·8	86°	1·05	1746	2·73	

Pounds of coal used in outward trip, including passage down the Delaware river, of which log is not given here, being broken by stoppages, was,	111,140
Pounds of ashes thrown overboard in all was,	21,741
Per centage of ashes to coal,	19½ per cent.
Pounds of coal used in homeward trip,	121,240
" ashes " "	21,765
Per centage of ashes to coal,	18 per cent.

The coal and ashes were both carefully weighed.

In the table the mean horse power exerted was found in the following manner. A large number of diagrams were taken during the trip under different conditions of throttle, cut-off, pressure and vacuum. Each diagram was calculated and the mean pressure found. The *theoretical* mean pressure due to the boiler pressure, back pressure in condenser, and point of cut-off was then calculated, and the ratio found between the two mean pressures. By classifying these ratios for different conditions of throttle, considerable uniformity was observed to exist in the results; the actual mean pressures were as follows:

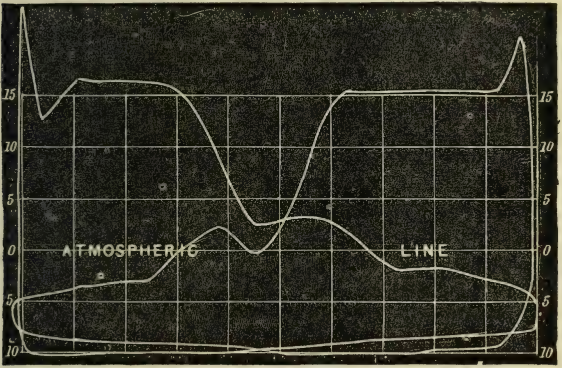
With throttle ¼ open	0·52	of the theoretical	M. P.
" ½ "	0·64	"	"
" ⅝ "	0·72	"	"
" ¾ "	0·75	"	"
" ⅞ "	0·78	"	"
" wide	0 80	"	"

For each hour, the boiler and condenser pressures, cut-off, and throttle being noted, the actual mean pressure and horse power were found by application of the proper ratio, and of those indicated horse powers the mean was inserted in the proper column. It is certain that the results must be substantially correct, and if any corroboration were

needed it may be found in the diagram given below, which was taken under conditions about the same as the average of the homeward trip, and the H. P. was for this diagram 315·36, and for that of the after engine at the same time 325·44, giving for both 640·8 H. P., or within 3 H. P. of the mean exerted by the table.

INDICATOR DIAGRAM, forward engine, taken Sept. 3d, 6·5 A. M.

Cut-off—10·5 inches.	Vacuum gauge—21½ inches.
Revolutions per minute—72.	Temperature hot-well—86° F.
Pressure of steam in boilers—18 lbs.	Mean pressure—14·75 lbs.
Throttle valve wide open.	Coal per H. P.—2·80 lbs.



During the whole trip only 13 (out of 14) furnaces were in use. The greatest number of revolutions made was $79\frac{6}{10}$ per minute for one hour. The highest for any four consecutive hours was $74\frac{4}{10}$.

The average consumption of coal for 638 H. P. was $18\frac{3}{4}$ tons per 24 hours. At the same rate to make 1000 H. P. would require $29\frac{1}{3}$ tons. The engine bunkers therefore hold $5\frac{1}{2}$ days coal at maximum steaming, and the extra bunk $2\frac{1}{2}$ days more; giving the ship an average speed at sea of 12·528 knots, if the speeds are as the cube roots of the powers. In other words, at this maximum speed, 1 ton of coal drives the ship $\frac{12{\cdot}528 \times 24}{29{\cdot}33} = 10{\cdot}25$ knots distance, and the bunkers afford a supply of coal to perform 2410 geographical miles. At the speed averaged, and which can be readily maintained, of 10·8 knots per hour, one ton of coal drives the ship $\frac{10{\cdot}8 \times 24}{18{\cdot}75} = 13{\cdot}8$ knots distance, and the bunkers hold coal for 3240 geographical miles.

The coal burnt during the trial was Blackheath, an anthracite of qualities not favorable for pushing, being by no means a free burning

coal, and requiring a strong draft for its combustion. And although free from clinker, the ashes formed a very large per centage, 19 per cent.

It was on this account only that the machinery developed on the trial trip less power than its capacity, the coal consumed being 1746 pounds per hour on 228 feet grate, or $7\frac{5}{8}$ pounds per sq. foot per hour.

The machinery worked with great smoothness and regularity, no trouble whatever having been experienced from hot journals during the trip.

The boilers were not blown at all to reduce saturation. The slight increase of saturation towards the end of the trip was caused by the salt water added to make up for leakages around stuffing-boxes, &c. To the latter cause is due the reduced vacuum during a part of the homeward trip, and until an opportunity was afforded in the Delaware river to put in fresh packing.

It should have been stated that the steam is condensed within the tubes of the condenser, and that the salt water is forced to circulate between and around them in a direction contrary to that taken by the steam.

To the Editor of the Journal of the Franklin Institute.

SIR:—In the *American Railway Times* of September 10th, appears an article entitled "Experiments on the Strength of several kinds of Building Stones," stated to have been "read before the American Institute of Architects, by Robert G. Hatfield, Esq.," but the Editor omitted to add "copied verbatim from the *Journal of the Franklin Institute* for March, 1858."—(See *Journal*, vol. 35, p. 158.)

For the Journal of the Franklin Institute.

Atmospheric Electricity. By JAMES P. ESPY.

It has not yet been ascertained by electricians, so far as I know, what is the cause of atmospheric electricity; those, however, who have studied my theory of storms and agree with me that there is an upmoving current of air in the centre of all storms, kept up by constant evolution of latent caloric, as the vapor condenses by the cold of diminished pressure as the air ascends with its vapor in it, will agree with me that it follows as a corollary from the following experiments, that *electricity must be generated simply by the upmoving current of air from the surface of the earth,* especially if it be violent enough, as it frequently is, to carry up drops of rain with it to a great height.

It is well known that all bodies, as Dr. Alex. Palagi of Bologne says, in their natural state give signs of positive electricity, when separating from the soil, and of negative, when approaching it. In the 23rd volume of Geneva Archives of Science, pp. 286 and 382, it is stated that Volpicelli caused a ball of metal to revolve on a horizontal axis of

glass, at a distance from that axis one metre and a half, and connected by means of a copper ribbon with a Volta's condenser—during a demi-revolution ascending, detaching it when descending—and in four demi-revolutions, he collected positive electricity enough to make the straws diverge so as to touch the interior sides of the electrometer.

When the connexion was made with the ball descending, negative electricity was obtained.

Now, in all storms, especially where floods of rain descend, there are at the sides and under those parts of the cloud where floods of rain descend, down-moving currents of air, and this will account for the sudden change of electricity from positive to negative so well known to all observers. Moreover, as there are thousands of up-moving currents of air every day nearly all over the earth, this theory will account for the upper air being almost always positively electrified, for a body cannot be removed upwards from the surface of the earth without becoming positively electrified, and, vice versa, a body cannot descend towards the surface without becoming negatively electrified. It would be well to examine the electric state of the air in the belts of high barometer, where the air must in general be descending, and also in the *annulus* of storms, where the barometer stands above the mean, and of course the air must be descending there, to see if the electricity is not sometimes negative, and, if so, electricity may become a means of predicting storms.

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*On Embroidery by Machinery.** By George Wallis.

(Continued from page 189.)

The original machine, as devised by M. Heilmann, was worked by one person, but had this feature been retained the economic value of the invention would have been lessened. It was only by extending the size and capabilities, improving the structure of the parts, without in any way interfering with the principle, which has always been the same, that it could be brought into successful operation as a paying manufacturing agent. In Switzerland the original form is still retained for cotton embroidery, and found to answer for that class of work.

From the time of its first introduction into England, until within the last two or three years, the embroidering machine was employed only by Messrs. James Houldsworth & Co., of Manchester, as the successors of Mr. Louis Schwabe. A few machines are now used by one or two other persons at Manchester, but the great mass of productions in machine embroidery still emanate from the original proprietors, who have some twenty machines, more or less actively employed.

After the death of Mr. Louis Schwabe, in 1845, these machines were gradually brought to bear upon ladies' dresses, and during 1847 and 1848, at which period I was actively engaged with my friends,

* From the Jour. of the Society of Arts, No. 333.

the Messrs. Houldsworth, in the development of the capabilities of the machines in this direction, it is not too much to say that the productions of this house, by mechanical means only, did much to foster and keep up the demand for embroidery; and so far from interfering with the hand labor, it is a fact that, in 1849, there were in London alone some 2000 persons obtaining their living by embroidery who had never done so before, and in Scotland and the north of Ireland some thousands of females were employed in this industry, not in large factories, but in their own houses. The patterns were printed in outline upon the merino or other fabric to be embroidered. These were distributed by traveling agents, and were afterwards collected by them from the workers after the embroidery was finished. As is now generally known, this is the method pursued in Scotland and the north of Ireland in the production of sewed muslins and tambour work.

The advantages of the embroidery machine over hand labor lie chiefly in two points.

1. The rapidity, accuracy, and excellence of work in the production of repetitions of the design in borders, sprigs, flounces, and trimmings for dresses.

2. The perfect embroidery of a pattern on each side of the fabric, as in the case of window curtains, table covers, and trimmings for upholstery purposes.

In the first of these it will be seen that, inasmuch as a needle can be worked at every inch and a half of a machine, and in a double row, there must be great economy in the execution of a pattern arranged so as to repeat at every inch and a half within the vertical range of the embroidering frame, that is to say, within the action of the pantagraph in its command over the rows of needles. The machine is therefore always worked at the greatest advantage when the full range of needles is brought into operation by small repeats, and at the greatest disadvantage when large repeats are worked, and thus a certain number of needles, or rather needle-holders or pincers, are idle. Thus in a pattern which is only repeated at every six inches, three pincers would be idle in every such space in the machine; and my own impression is, that with less than a dozen needles at work, the machine operates at a loss, or at least that there is no gain in the work, except in the matter of a double-sided pattern. The usual calculation is that with less than eight needles the work is executed at a loss.

This is, of course, one of the disadvantages of the machine in certain classes of the work; and except under certain peculiar arrangements of the design, there was always great difficulty in competing with hand labor, in the execution of the "collonade" fronts of ladies dresses at the period these were in fashion. On the contrary, in bordered and flounced dresses, hand labor had no chance with the machine.

As may be supposed, these machines presented an apparently insurmountable obstacle in the execution of a series of repeats in a curved line, which a few years ago was one of the problems yet to be solved. Mr. James Houldsworth, the present proprietor, however, has

overcome this difficulty in suitable fabrics, by constructing an embroidering frame for insertion into the machine, on which the fabric being stretched upon elastic cross pieces, and screwed up to the desired curvature, the design is embroidered in a right line, but when the fabric regains its original position on removal from the frame, this line becomes a curve, the reverse of the direction in which it was stretched.

Embroidery for dresses being comparatively out of fashion, the machines are chiefly used at the present time for furniture fabrics, such as window curtains, table covers, valences, borderings, and goods for foreign markets, of which there are before you some admirable specimens, all produced by Messrs. James Houldsworth & Co., of Manchester.

Some of the capabilities of the embroidering machine are shown in these examples. The work is clear, fine, and according to the character of the design, perfect in all its parts; whilst the advantage of having the pattern complete on both sides of the fabric must be apparent to every one, especially in table covers and window curtain borders. Here the peculiar action of the machine in driving the needles through at a perfect right angle, and returning them at the same angle, becomes of great value; not, after all, that the two sides are equally perfect, yet no unpractised eye would easily detect the difference. When, however, the hand embroiderer attempts this kind of effect, the amount of attention required to execute the work, with even a moderate degree of precision, renders the operation any thing but an economical one.

An example of work, as applied to linen and cotton fabrics, not previously attempted in these machines, has reached me to-day. When the operation is perfected by the necessary experience, the result will no doubt be satisfactory, as the style of embroidery is well adapted to a great variety of articles in ladies' dress.

In the matter of design as applied to machine embroidery, it must be evident that there are certain peculiarities about it which the artist, to be successful, must thoroughly understand.

The repeats of the pattern must all be either one inch and a half wide, or multiples of that width; that is to say, three, four and a half or six inches, and so on. The vertical range may be said to be unlimited, except by economy of production; for by means of the rollers on which the fabric is placed, the work can be carried even into stripes, as indeed, has been done when necessary. In making a working design, the length of stitch has to be carefully kept in view, and the angle at which the thread will lie when the work is seen as a whole. In hand embroidery this is also a condition, but in that great masses of these stitches may be brought together, which is a peculiarity of Eastern embroidery, and the effect produced by the contrasting angles at which the thread is inserted is often very remarkable, especially when different shades of the same tint or color have been employed. In machine embroidery this kind of effect cannot be imitated successfully or economically, and it is usual to keep each form

as much as possible to one, or, at most, two series of stitches. Shaded effects, however, are produced, as in the case of the dress embroidered for Her Majesty, the Queen, by dyeing the silk with a graduated tint or shade, by which the thread is dark at one end and gradually becomes light at the other end. Pleasing effects are thus produced in a very economical manner, even in what are called self-colored embroideries —say, on dark green merino, embroidered with silk shaded from dark to light green. These irregular effects of light and shadow are not, however, very legitimate when viewed artistically; but for this the manufacturer cares quite as little as the consumer. If the thing sells with the one, and "looks pretty" to the other, that is enough according to the art-creed of both.

There is yet another point which in the smaller patterns it is of considerable importance for the designer to bear in mind. Silk at 40s. per pound is too costly to be wasted, therefore it is desirable that each needleful should do its work, and that no fragments should remain to cut away at a loss. Hence patterns have to be designed to the needleful; and, if a pattern, however excellent in the abstract it may be, consumed one needleful and 36 inches out of two needlefuls of 42 inches each, it would be considered any thing but sound economy in machine embroidery to execute it, as eight inches of silk would be lost in each needle employed—a waste upon any extent of production which would astonish those who are not in the habit of thinking about mere fragments in the materials of manufacture. It will at once be seen from this fact that the designs for machine embroidery must ever be somewhat peculiar, and, to a certain extent, limited in range of form, and that all the more successful—certainly the most economical—are made almost in the presence of the machine by which they are to be executed, and, for the most part, under no higher inspiration than that of a species of artistic measure table, such as:—

Two needlefuls make one flower.
Three flowers make one repeat.
Twenty repeats make one border.
Four borders make one table cover decoration.

One can thus tell almost to an inch—certainly to a yard—how much silk will be consumed in a given operation.

It will now be asked, "Do these machines begin and finish their work completely?" Not absolutely; but so perfect is the work in a well-arranged pattern that, with the exception of the cutting out of certain ends used for starting points, the occasional fastening of other ends, and the insertion here and there of a stitch by hand, the work is practically finished when it leaves the machine. Experienced hand embroiderers, acquainted with the peculiarities of machine work, are, however, employed to look it over.

As a branch of factory labor for females, none is so healthy, certainly none more interesting.

The workers are generally the most intelligent of their class, and their wages are fully remunerative when work is abundant; but there is one great drawback in the economical working of these machines,

in contradistinction to that of most other manufacturing agents. The fashion for embroidery fluctuates very much. In times of increased demand there is great anxiety and much trouble in instructing even the generally intelligent girls who are desirous to get this kind of employment.

A sudden change of fashion throws the machines out of work, and with them the workers, and when a demand again occurs, fresh hands have to be instructed. Happily, there is less change in furniture fabrics than in dresses, and thus the best hands are retained ready for an emergency and the instruction of others; but the operative classes are now keenly alive to the disagreeable character of fluctuating employments, alike to employer and employed; and thus the difficulty is increased even to such a house as that of the proprietors of these machines, whose reputation as employers of factory hands has always stood so high.

In concluding this attempt to explain the mechanical principle and economic application of one of the most interesting agents which, in the progress of modern invention, has been brought to bear upon textile decoration, it is only right to state that the imperfections of the exposition are inherent in the subject, and nothing but a very earnest desire to comply with the wishes of the managing officers of the Society of Arts, that a popular explanation of the construction and peculiarities of the embroidering machine should be given to the members, would have induced me to undertake the task, under the many disadvantages which must necessarily arise out of the fact that my connexion with these machines, in a practical form, ceased ten years ago, and I doubt if I have seen them more than three times in the interval.

(To be Continued.)

The Explosion on the Great Eastern.

The cause of the explosion on the *Great Eastern* is thus explained in the Portland correspondence of the *London Times*, Sept. 11:—

"In order fully to understand, as far as it is yet known, the cause of the accident, it will be necessary to say a few words on the peculiar construction of the two forward funnels for the paddle boilers. In the first plans for the vessel it was determined, in order to economize the heat given off by the funnels, and to keep the saloons through which they passed cool, to fit them all with what is termed a 'feed pipe casing,' rising from the boilers to about eight feet above the upper deck. This feed pipe casing is simply a double or outer funnel for the length we have stated, the inner one, as usual, carrying off the smoke and flame, and the space between it and the outer casing being filled with water. The water is pumped in at the top of the casing while cold, and gradually passing down into the space round the furnaces, becomes greatly heated, when it is discharged into the boilers by means of an ordinary stop-cock. A plan by which so much coolness is supposed to be gained in the berths and saloons, and so much fuel

saved by the ample supply of hot water to the boilers, promises such obvious advantages that for the last ten years attempts of every kind have been made to carry out the principle successfully on board most of the sea-going steamers. In no one instance has the plan ever yet succeeded. In but too many cases the funnels have done what the funnel of the *Great Eastern* did on such a colossal scale last Friday evening. When such an accident has not occurred, the pressure of the column of water upon the base of the funnel near the furnaces has been so great as to cause them, when strained in bad weather or worn by long use, to leak into the fires and extinguish them more or less rapidly. Any one the least conversant with boiler mechanism will see, too, at a glance, that the safety of the whole affair depends upon the stop-cock which lets off the water into the boilers being watched with unremitting vigilance. The neglect of this for half an hour would allow steam to generate in the casing, which would then, in plain terms, become a gigantic boiler, without a valve or any means of letting off its steam, save by blowing up. This was the apparatus which, as I have explained, in order to economize heat and cool the saloons, it was proposed to introduce on board the *Great Eastern* in the three funnels to the screw engine, and the two forward funnels for the paddles. Messrs. Bolton and Watt were entrusted with the construction of the screw engines and boilers, and they at once firmly refused to have any such casing round their funnels, or attached to their engines in any way whatever. I am not aware of the precise reason on which they grounded their refusal, though doubtless they rested mainly on the obvious fact, that the plan had been tried over and over again and always failed, with more or less of inconvenience or disaster. The plan, however, was adopted for the two paddle funnels, though at about that time the Collins' line of steamers, which had tried the plan for nearly three years, discarded it as often dangerous and always worthless. The casings of the two forward funnels of the *Great Eastern* held each about seven or eight tons of water, and the forward one, at least, it is now evident, might have exploded at any moment during the voyage, when the grand saloon was filled with the visitors on board to listen to the admirable music of the ship's band."

The explosion is thus described by the same correspondent:

"The visitors who were passengers on board numbered about 100, and, as may readily be believed, included among them some of the most distinguished navigators, engineers, and scientific men in Europe. All, as usual, were assembled at dinner at about 5½ o'clock on Friday, when before the dessert came on, two gentlemen left the Chairman's table to look at the coast near Hastings. Mr. Campbell, the Marquis of Stafford, Earl of Mount Charles, Lord Alfred Paget, and a few others followed, without waiting for dessert. The departure of these gentlemen from the saloon, as it happened, broke up the dinner party, and instead of retiring to the grand saloon, as usual, nearly all the visitors came on deck, and went right forward in the bows. About 30 remained at table—a few were on the bridge with Mr. Campbell, and thus, by a most merciful interposition, it happened, for the first time

during the voyage, that there was no one sitting in the grand saloon, and no one on the little raised deck round the foremost funnel. One or two gentlemen were congratulating Mr. Campbell on the almost marvellous success of the ship, when in the space of a second there was a terrific explosion. The forward part of the deck appeared to spring like a mine, blowing the funnel up into the air. There was a confused heavy roar, amid which came the awful crash of timber and iron mingled together with frightful uproar, and then all was hidden in a rush of steam. Blinded and almost stunned by the overwhelming concussion, those on the bridge stood motionless in the white vapor till they were reminded of the necessity of seeking shelter by the shower of wreck—glass, gilt work, saloon ornaments, and pieces of wood, which began to fall like rain in all directions. The prolonged clatter of these as they fell prevented any one aft the bridge from moving, and though all knew that a fearful accident had occurred none were aware of its extent, or what was likely next to happen. After a short interval, during which the white steam still obscured all aft the funnel, Captain Comstock, who was on the bridge, tried to see what had occurred, but he could only ascertain, by peering over the edge of the paddle-box, that the vessel's sides were uninjured, and the engines still going. Gradually then, as the steam cleared off, the foremost funnel could be seen lying like a log across the deck, which was covered with bits of glass, gilding, fragments of curtains and silk hangings, window frames, scraps of wood blown into splinters, and a mass of fragments, which had evidently come from the cabin fittings of the lower deck, beneath the grand saloon. In the middle was a great heap of rubbish where the funnel had stood, from which the condensed steam was rushing up in a white, and therefore not hot, vapor, but enough to hide completely all that had happened below. In another minute all the passengers came rushing toward the spot. The 20 or 30 who had remained at table in the saloon next that which blew up came on deck also, and it will give your readers some idea of the gigantic strength of the vessel when I tell them that these latter until they actually saw the smash, were almost unaware of the terrific explosion which had occurred beside them. It was only the dull, heavy roar, followed by the rattling of fragments as they rained down on and through the sky-lights, which warned them that something dreadful had occurred. Still none knew what had really happened or what injury the vessel had sustained. Capt. Harrison, who was aft at the moment, rushed forward, and, seizing a rope, lowered himself down through the steam into the wreck of the grand saloon, and, calling to six men to follow him, began a search among the ruins for those who might have been below. The only one in the apartment was his own little daughter, who had just arrived at the after part at the moment of the explosion, and who, completely sheltered by the wrought iron bulkhead, had escaped, by a miracle, totally unhurt. Capt. Harrison merely gave the order to pass her up through the sky-lights, and continued his search. This was no easy matter. The wreck and rubbish piled in all directions in the ladies' small saloon, forward of the funnel, made it difficult to move about.

The steam hid almost every object; the place was broken, the floor in parts upheaved and riven, so as to show a still more frightful smash in the saloons and cabins below. Through these apertures the bright glare beneath the lower deck of all showed that the furnace doors had either been blown open or blown away, and the funnel being gone, the draft was down the remains of the chimney, forcing out the flames and ashes in a fierce and dangerous stream. This, as the embers touched water, sent up a close, suffocating air—half steam, half gas—in which it was difficult to see, and almost impossible to breathe.

In the meantime, most on board, including the visitors, took steps to restore order and confidence. As I have already said, there were fortunately no holiday tourists there, or the matter would have been much worse. Some of the ablest engineers and machinists were on deck, who could pretty well guess what had happened, and what worse might follow. A funnel, filled similarly to that which had blown up, was evidently getting intensely hot, and of those present none knew to what extent its "jacket," or outer casing, had been damaged, or how soon it might explode. Mr. Scott Russell, followed by one or two engineers, at once went below to the furnaces of these boilers, and ordered the steam to be blown off, the speed of the engines to be reduced, and every precaution taken to guard against mishap. Mr. Campbell remained calm and collected on deck, getting the crew forward and preventing any unnecessary alarm. Some of the men instantly went below to search for those employed in the stoke-holes, whom it was now evident must be fearfully injured, if indeed alive. Mr. Trotman, with one or two others, went below to the lower deck cabins, where one at least was known to be covered by the wreck, while Capt. Harrison came on deck and ordered the ship's course to be altered toward the land till it could be ascertained that there was no immediate danger from fire or injury to the frame of the vessel below. The former risk appeared to be the most imminent, as the flames were still rushing fiercely from the furnace doors. The hose was therefore ordered to be laid on, and instant preparations made for extinguishing the fires.

The hose was got at once into play, and a stream of water was poured down into the stoke-hole beneath the lower deck, so as in a few minutes to quench the fire in the furnaces, and put at rest all fear of danger from that source. Within twenty minutes after the blow-up the real cause and nature of the mishap was known, and the total safety of all the engines and after boilers was definitely ascertained. Fearful as was the explosion, it was seen that, owing to the immense strength of the ship, its violence had been entirely confined to the compartment in which it had occurred, and it was determined to resume the original course and steer for Portland. All danger from fire or another explosion being now at an end, those who chose were enabled to go down and examine for themselves the scene of the disaster. The litter on the deck showed that in the compartment in which it had taken place, and where it was confined by the wrought iron bulkheads, it had been wide and general. The fore part of Mr.

Crace's beautiful saloon was a pile of glittering rubbish, a mere confused mass of boards, carpet shreds, hangings, mirrors, gilt frames, and splinters of ornaments; the rich gilt castings were broken and thrown down, the brass work ripped, the handsome cast iron columns round the funnel overturned and strewed about. In the more forward part, a state sitting-room for ladies, every single thing was destroyed, and the wooden flooring broken and wrenched up. What the consequence would have been if it had taken place an hour later, when the visitors would be sitting in the saloon, is almost fearful to think upon. But the damage in this part seemed a mere bagatelle when compared with the ravages among the lower deck cabins beneath. It was difficult to go down there, for the whole place was filled with fragments of boards, chairs, beds, cabin fittings, broken steam pipes and syphon-tubes, torn-out rivets, and masses of the inner and outer funnels rent to pieces like calico, and lying about like heaps of crumpled cardboard. Everything was in literal fragments. The course of the explosion could then be seen at once. The water, or rather steam, in the casing had crushed in the inner casing, blowing up the funnel above deck, while both funnels below it were torn to pieces, and hurled about, sometimes in single rivets or scraps no longer than one's hand, sometimes in crumpled up lumps weighing several hundred weight. Beneath this deck, toward the stoke-hole, where the remnants of the funnel left a yawning hole like an extinct volcano, the force of the explosion was still more manifest. Not only was the iron compartment nearest to the boiler partly rent and pushed back, but one of the main deck beams, an enormously massive wrought iron girder about two feet deep, and strengthened with angle irons, was wrenched back and nearly bent in halves. In some parts the explosion seems to have acted with the capricious violence of lightning. Thus, in the grand saloon the two largest mirrors on each side of it, running fore and aft, were quite unbroken, though the silvering was boiled off the backs of both by the heat of the steam. By the side of these glasses cast iron columns were bent and broken, and mirrors at four times the distance from the seat of the disaster were almost pulverized, and their framings even destroyed. The beautiful oak stair-cases descending to the saloons were blown up like card-work; yet not a book on the library shelves, close to the funnel, was stirred. At the bottom of the stoke-hole I found one of the gilt framings, which were placed round the windows of the saloon; it was perfectly uninjured. For your readers to understand this singularity they must suppose one house—say number eight—to have had an explosion in its cellar, and among the ruin is found uninjured, a drawing-room picture belonging to the next door neighbor at number nine. The boiler, so far as can be judged from a superficial examination, stands firm; a close scrutiny, however, will be necessary to enable the engineers to determine whether any part of it, more especially its tubes, are injured. It seems almost too much to hope that when such a severe concussion was experienced, it can have escaped entirely without injury. Near and upon the boiler lie scraps

and morsels of the funnels, which show where the first tearing away commenced before the inner casing was blown up to the deck.

The Coroner's inquest on the bodies of the five unfortunate stokers —John Boyd, Michael Mahon, Michael McRoy, Robert Adams, and Richard Edwards—was held at the Town Hall at Weymouth, before Mr. Henry Lock, the Coroner for Dorset.

The first witness examined was James Briscoe, the junior engineer of the paddle engine department, who said that it was his duty to attend to the direction of the engineers in charge of the paddle engines on duty, and to render assistance under their direction. He was told not to meddle with or make himself responsible for any of the cocks or valves. The donkey-engine which pumped into the boiler was out of order, and did not perform its duty satisfactorily. The donkey-engine on the port side of the ship in the forward stoke-hole had broken down. One minute before the explosion, Mr. M'Lennan, the Chief Engineer of the ship, came down to witness, and looked to the saturation of the water in the boilers, and said, on leaving, that everything seemed right; knew that the bursting of the water-heater round the forward funnel caused the explosion. At the time of the explosion, the boilers were not being fed from the casing, which was evident from the low temperature of the water going into the boiler. They had ceased to feed the boilers from the water casing, he believed, to get a greater amount of water into the boiler. If the water casing had been regularly kept supplied with water, and a continual flow in and out, the accident would not have happened. There were two stand-pipes to the water casing, which, if open, would have prevented it.

Mr. Brenton, one of Mr. Brunel's principal engineers, was called to give evidence to the probable cause of the accident. Witness was accompanied in his examination by Mr. M'Connel (the Engineer of the North-Western Railway), Mr. Scott Russell, Mr. Smith (the inventor of the screw-propeller), Mr. W. Smith (a civil engineer), and Mr. Bates, who represented the firm of Bolton & Watt. Witness and those with him came to a conclusion as to the cause of the accident. The double funnel casing was not always applied to other steam boilers. The fact of the wood-work around the funnel being blown away led witness to see the cause of the accident without the drawings or explanations.— They ascertained that the funnel was double for 40 feet of its length, the inside one being 6 feet in diameter, and the outside one 7 feet, leaving a space of 6 inches between the two all round. The water was contained between the two; the explosion took place about half way down, near the lower deck. The inner casing was collapsed, and the outer one burst out. The object of the casing was to prevent the water being led direct to the boilers. There was an apparatus provided to prevent any excessive pressure accumulating in the water-jacket. This apparatus consisted of a "stand-pipe," which was carried to near the level of the top of the funnel, and communicated with the water-jacket, constituting a safety-valve. Being open at top, as soon as the pressure increases it runs out of the "stand-pipe." The height of the column of water regulated the pressure in the jackets. From inquiry, they

learned that the feed-water for the boiler was sent direct to the boiler, without passing through the funnel, as the donkey-engines did not work satisfactorily; one of them being disabled, the other had to do the work of two. That accounted for the fact of the communication between the boilers and the casing being shut off. An explosion ought not to have occurred if the "stand-pipe" was in operation. Their attention was called to the state of the stand-pipe, and they found at the bottom of it a plug capable of being turned. It was shut off, leaving no vent for the steam generated in the case. If the "stand-pipe" had been in operation, or if the feed was continued through the jacket, the explosion would not have occurred. The steam must have gone on generating till the cylinder burst. No one seemed to know how, when, or by whom the cock was shut. Two or three days before the ship sailed, the "stand-pipe" not being high enough, a piece was added to it, so that up to that time the cock must have been open. It was supposed to have been closed by some workman for some purpose, and not to have been again opened. If the cock had been taken off, the accident could never have happened. The cock was put on to test the cases by hydraulic pressure, and had not been removed. The cock could not have been closed by the force of the explosion, or, indeed, witness could not conceive the accident occurring.

The inquest was resumed next day, Mr. John Scott Russell having come from London to be present.

Mr. John Dickson, foreman to Mr. Russell, and under whose superintendence the machinery of the paddle engines was fitted, was also present, and Mr. M'Lennan, the Chief Engineer of the *Great Eastern.*

The Coroner said that, on the opening of the inquest, he at once considered that it was a case which ought to be adjourned, in order that the Jury might have the assistance of some of the surveyors from the Board of Trade. He had accordingly communicated with the Board of Trade, and received a letter in reply the previous day, which stated that it was impossible that Capt. Robertson, the Surveyor-General, could attend the inquiry before Saturday next. He therefore thought that, under those circumstances, it would be most advisable that the Jury should have the benefit of the experience of those officers, and, with their permission, he would adjourn further proceedings till Saturday morning at nine o'clock. He (the Coroner) trusted that both the Company and Mr. Scott Russell would be ready on that occasion with any evidence which could throw the smallest light upon the causes which had led to so disastrous an accident.

Mr. Scott Russell said that it would be proved by witnesses that the cock of the valve was open on Tuesday, and when the vessel left the river on Wednesday.

The inquiry was then adjourned till Saturday morning.

The interest evinced by the public in this part of the country in all relating to the ship seems as great as ever. Nearly 6000 persons paid their half-crowns to go on board, and promenaded the deck all day, defying the squalls of wind and rain with an endurance worthy of a better cause.

The repair of the damages inflicted by the explosion has already commenced, Mr. Scott Russell having contracted to restore the whole for £5000. If it should turn out that either of the forward boilers have been injured, £5000 will scarcely suffice for the entire restoration.—From the fact of there having been no escape of steam from either of the boilers at the time of the explosion, when there was a pressure on each of 22 lbs., it is believed that they have escaped without material injury. The mere joinery of the cabin fittings and the redecoration of the grand saloon can, and doubtless will, soon be completed. With the ironwork, however, it is a different affair. All this must be executed in London from the working drawings of the vessel, and sent down piece-meal by rail to Weymouth, where it can be bolted together on board the ship. Mr. Scott Russell's contract is to finish the whole ship in her former state as she left the river, within three weeks.

New Action of Light.

The Abbè Moigno gives us still a new and curious result of the researches of M. Niepce de St. Victor. If a solution of starch or dextrine be subjected to the action of solar light for a short time, (say for a quarter of an hour, if there be but a very small quantity of matter) it will be found to be completely changed into glucose, (grape sugar) whose presence is easily recognised by the ordinary reactions; and even by its sweet taste. M. Niepce thinks that he has determined that by surrounding the bunches of grapes in the early part of autumn by bags of white paper dipped in tartaric acid, not only their ripening is hastened, but the quantity of sugar which they contain is greatly increased. Tartaric acid is now well-known to have the power of *storing up* the light in the condition of chemical efficacy.

Cosmos, 1st July, 1859, p. 12.

Approximate Quadrature of the Circle.

We take from the *Cosmos* the following pretty geometrical construction for an approximate quadrature of the circle:—

Describe the given circle, and let A B be a diameter. From A set off the quadrant A C, and from C set off in the same direction an arc A C $= 60°$. Bisect the chord A C in E; and from A draw A E, and prolong it until it meets the circumference in F. Then will A F be the side of a square whose area is approximately equal to that of the circle.

The difference of the areas is about $\frac{1}{3747}$.

The Use of Soluble Glass for Preventing Combustion of Wood.

The English government have caused experiments to be made on wood prepared in the following way: first, it was painted over with two or three coats of a feeble solution of the glass (1 vol. of the

siropy solution to 3 of water). The wood absorbs this freely. When these coats were nearly dry, a coating of ordinary whitewash was given, and, when this again was nearly dry, it was fixed by a stronger solution of the soluble glass (2 vols. of sirop to 3 of water). A second application of this will not be necessary, unless the whitewash has been too thick.

The experiments showed that wood thus prepared is almost incombustible, and that it does not scale or split off when the wood becomes hot; rain has no action on it; a long exposure to a powerful jet of water partially washed it off. One pound of soluble glass was sufficient for a surface of a square yard.

For the Journal of the Franklin Institute.

Particulars of the Steamer De Soto.

Hull built by Lawrence & Foulkes. Machinery by Morgan Iron Works, New York. Intended service, New Orleans and New York.

Hull.—

Length on deck, from fore part of stem to after part of stern post, above the spar deck,	252 feet.
Breadth of beam at midship section,	38 " 8 inches.
Floor timber, at throat—molded, 16 ins.—sided, 14 ins.	
Frames—apart at centres, 28 inches—strapped with diagonal and double laid iron straps, 4 × $\frac{5}{8}$ inches.	
Depth of hold,	19 " 2 "
" to spar deck,	26 " 8 "
Draft of water at load line,	15 "
Area of immersed midship section at this draft,	530 sq. ft.
Tonnage, custom-house,	1600.
Masts and rig—Brig.	

Engine.—Vertical beam.

Diameter of cylinder,	65 inches.
Length of stroke,	11 feet.
Maximum pressure of steam in pounds,	20.
Cut-off—half stroke.	
Maximum revolutions per minute,	18.

Boilers.—Two—Single return flued.

Length of boilers,	27 feet.
Breadth "	12 "
Height " exclusive of steam chimney,	10 "
Number of furnaces,	(3 in each.) 6.
Breadth "	38 & 44 "
Length of grate bars,	7 " 6 "
Number of flues,	36.
Internal diameter of flues,	8, 10, 11, 12, 13, and 16 in.
Length of flues,	19 ft. 6 in. and 13 " 3 "
Diameter of smoke pipe,	6 " 6 "
Height "	32 "
Description of coal,	Anthracite.

Paddle Wheels.—

Diameter,	30 "
Length of blades,	9 "
Depth "	18 "
Number "	26.

C. H. H.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, September 15, 1859.

William B. Atkinson, President P. T., in the chair.

Isaac B. Garrigues, Recording Secretary.

The minutes of the last meeting were read and approved.

A letter from the Mercantile Library Association, of the City of New York, was read.

Donations to the Library were received from the Institute of Actuaries, London; the Commissioners of Patents, Washington, D. C.; the Mercantile Library Association, City of New York; Profs. J. C. Cresson and J. F. Frazer, and Messrs. Jones, White, & McCurdy, and H. P. M. Birkinbine, Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement of the receipts and payments for the month of August, was read.

The Board of Managers and Standing Committees reported their minutes.

The Committee on Exhibitions reported that, at their stated meeting held August 9th, they awarded a first class premium to Appleton, Tracy & Co., of Philadelphia, for their American Watches, and to John F. Mascher of Philadelphia, for his Railway Timing Clock, on the reports of the Committee on Science and the Arts.

Candidates for membership in the Institute (6) were proposed, and the candidates (5) proposed at the last meeting were duly elected.

A number of photographic views of the extension of the Philadelphia Water Works, were then presented by H. P. M. Birkinbine, Esq.

Mr. P. Shreiner presented his patent stove, which he illustrated by a model and drawing, and explained as follows:—It does away the objection usually made to iron cylinders, by forming *air-tubes* out of a portion of the cylinder, and causing a strong current of air to pass along the cylinder to the drums placed in the interior of the furnace. This is perfectly gas tight at the top, and by an increased rush of cold air through the tubes, prevents the cylinder and drums from becoming red hot, thus securing a more healthful heat. By retaining in a cylinder or chamber above the fire-pot, and taking it rapidly out of the retainer, by the introduction of cold air by means of an extra cylinder which surrounds the retainer, the heat is prevented from escaping through the smoke-pipe, but is distributed through the apartments of the building. The smoke and gas are consumed by being compressed or forced back in contact with the fire. The gas being consumed, one source of destruction to the chimney is removed—the formation of sulphuric acid by admixture with the oxygen of the air.

He also showed how his invention radiated the heat in direct lines from all parts of its surface, and, by being encased, produced a double air heater. An ordinary heater with but capacity sufficient to heat

one room, by his improvement, can be increased in heating power so as to produce sufficient to heat an additional room of equal dimensions above. He claims a great saving of fuel, and freedom from dust in the room in which it is placed.

It is equally advantageous for cooking purposes, but want of time has prevented the inventor from furnishing models elucidating all its advantages.

One has been ordered, and is now being prepared, for the State Normal School at Millersville, Lancaster County.

Mr. Raif exhibited a small model of a machine to print the names of subscribers on newspapers, &c. It is a series of type boxes on an endless band; and, by depressing a lever, the letters are inked, and the paper brought up, printed and pushed off, ready for the next.

Mr. I. N. Coffin exhibited a Batchelder's Lamp for burning coal oils without a chimney, for which he obtained a patent Dec. 28, 1858. He stated that this lamp is designed for burning all kinds of coal oils without employing the common glass chimney, and thus avoiding the expense of their breaking and the inconvenience of the lamp getting out of order from that cause, and also to obtain the greatest amount of illumination from the combustion of a given amount of oil. The invention consists in the use of tapers or wick tubes, placed below and on both sides of a flat wick tube or main illuminating burner, in combination with a suitable cap, thus supplying sufficient oxygen completely to burn the oil without a chimney, and also without raising the cap so as to obscure a large portion of the flame. The lower part of the cap is screwed upon the lamp in the usual manner. Above this is a reticulated ring for the purpose of admitting air under the wick cap, which is slotted at the top to fit a flat wick. This ring is removable for the purpose of cleaning. By the contraction of the cap near the top, the air is concentrated upon the flame. Into the lower part of the cap are inserted the usual wick tube, and likewise two very small and short wick tubes. By this arrangement, the lamp when trimmed and lighted, has a stronger draft on account of the tapers in the short tubes; consequently the outer cap may be lowered upon the main wick tube, so that the illuminating flame is almost entirely above the cap. In other lamps where the draft is to be produced by the wick cap alone, it is necessary to elevate this cap so as to give a considerable volume of heated air in the upper part of the cap, in order to create sufficient draft; but this elevation of the cap obscures more of the flame and lessens the illuminating power of the lamp. On the contrary, by the use of the small draft lights, the top of the cap may be adjusted about half an inch lower upon the illuminating burner without causing the lamp to smoke; consequently it is practicable to secure a greater illuminating power from a given amount of oil, and to dispense altogether with glass chimneys, which are liable to break, difficult to keep clean, and otherwise objectionable. For further information, letters, or orders for the lamp, or for County or State rights of the patent, may be addressed to Isaac N. Coffin, care of Dr. William B. Atkinson, No. 215 Spruce Street, Philadelphia.

Abstract of Meteorological Observations for July, 1859; made in Philadelphia, Somerset, Dauphin, and Centre Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

1859.	PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.									SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.						HARRISBURG, Dauphin Co. 40° 16′, N. 76° 15′, W. JOHN HEISELY, M D., Obs.				FLEMING, Centre Co. 40° 55′ N. 77° 53′ W. Ht. 780 ft. S. BRUGGER, Obs.		
	Barometer.		Thermometer.			Relative humidity.	Force of vapor.	Rain.	Prevail'g winds.	Bar.	Ther.	Relative humidity.	Force of vapor.	Rain.	Prevail'g winds	Bar.	Ther.	Rain.	Prevail'g winds.	Ther.	Rain.	Prevailing winds.
July.	Mean.	Mean daily range.	Mean.	Daily oscillation.	Mean daily range.	2 P. M.	2 P.M.			Mean.	Mean.	2 P.M.	2 P.M.			Mean.	Mean			Mean.		
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	Direc.	Inch.	°	Per ct.	Inch.	Inch.	Direc.	Inch.	°	Inch.	Direc.	°	Inch.	Direc.
1	29·915	·120	70·7	27	6·3	44	·461		(var.)	27·704	69·3	56	·635		S W.	29·790	76·3		S W.	69·0		N W.
2	29·736	·179	81·5	28½	10·8	60	·890		S W.	27·613	74·3	55	·704	0·643	(var.)	29·627	85·3	0·208	S.	79·7	0·355	S W.
3	29·690	·102	72·7	20½	11·2	80	·821	0·520	W.	27·625	65·7	68	·614	0·266	W.	29·623	75·3	0·424	W.	71·0	0·232	(var.)
4	30 032	·342	63·2	17½	9·5	44	·322		N W.	27·876	55·7	55	·362		N E.				N W.	58·7		(var.)
5	30·197	·164	68·5	20	5·3	32	·268		N N E.	27·965	58·3	52	·366		N E.	30.116	68·0		N.	60 7		(var.)
6	30·109	·088	71·3	25	2·8	33	·327		N E.	27·946	53·3	79	·387	0·085	?	30·013	72·7		W.	61·3		N W.
☾ 7	30·013	·096	71·8	23	2·8	49	·504		N E.	27·842	63·3	53	·455		E.	29·938	75 0		S E.	64·3		(var.)
8	29·982	·031	74·0	19	2·2	45	·495		S S W.	27·812	68·3	62	·611		S E.	29·906	78·3		S E.	72·7		S W.
9	29·978	·032	80·2	23	6·2	47	·588		(var.)	27·813	71·7	56	·609		E.	29·884	82·7		S.	75·7		(var.)
10	30·043	·065	76·0	23	4·5	39	·503		S S E.	27 867	74·0	56	·635		E S E.	29·952	82·0		S.	75·3		S E.
11	29·991	·052	79·5	23	3·5	44	·574		S W.	27·846	75·0	58	·747		W.	29·907	82·0		S.	78·0		W.
12	29·864	·127	85·2	25	5 7	47	·747		S W.	27·797	77·0	53	727		NNW.	29·807	87·0		S.	80·0		W.
13	29·811	·096	86·5	25	5·3	50	·818	1·148	(var.)	27·760	80·0	54	·813		N W.	29·723	90·3		W.	85·0		N W.
○ 14	29·890	·079	82·7	20½	3·8	55	·773		(var.)	27·745	82·3	56	·950		(var.)	29·781	87·3		S.	84·0		(var.)
15	29·914	·051	75·8	15	6·8	45	·472		S E.	27·687	72·3	81	·704	0·268	S E.	29·800	76 7	} 2·070	S E.	75·3	0·792	S W.
16	29·732	·182	75 7	15	0·8	71	·772	0·355	N.	27·618	75·0	62	·683		N W.	29·639	80·7		W.	76·3		N W.
17	29.721	·031	80·5	22	4·8	58	·733		N.	27·642	76·7	57	·771	0·040	W.	29·636	84·0		W.	79·0	0·042	W.
18	29·743	·022	84·5	20	5·7	46	·671	0·220	(var.)	27·644	77·0	52	·743		W.	29 647	86·3	0·646	W.	82·0	0·050	S W.
19	29·642	·101	77·7	12	6·8	78	·800	0·035	N N E.	27·527	74·7	71	·772	0·396	(var.)	29·520	83·0		S.	77 3		N W.
20	29·600	·082	80·8	22	4·8	42	·608		N W.	27·533	73 0	64	·745		W N W	29·509	85·0		(var.)	75·7		W.
21	29·787	·188	75·5	17	5·3	47	·464		S W.	27·628	68·7	58	·598		(var.)	29·695	77·0		N.	68·7		(var.)
☽ 22	29·640	·148	74·3	14	1·8	66	·676	0·695	S W.	27·497	69·0	53	·529	0·036	W.	29·489	80·7		(var.)	73·3	0·130	(var.)
23	29 700	·118	74·7	16	3·7	35	·344		N W.	27 593	64·0	67	·545		(var.)	29·604	76·3		N W.	65·0		N W.
24	29·826	·126	72·7	23	3·3	43	·443		S W.	27·654	64·3	53	·491		S.	29·736	74·0		S.	64·3		N W.
25	29·803	·023	72·8	14	3·5	75	·659	0·002	(var.)	27 621	70·0	51	·540		N W.	29·671	79 3		S W.	75·7		(var.)
26	29 738	·064	76·5	15	3·7	67	·730	0·940	S S W.	27·618	70·0	55	·498		W N W	29·562	80·3		N W.	70 3		N W.
27	29 720	·047	72·2	20	4·3	47	·438		N W.	27·641	61·7	56	·397		N W.	29·636	75·0		N W.	67·3		N W.
28	29·781	·060	74·0	20	1·8	43	·429		W N W	27·672	59·3	52	·384		N W.				W.	66·7		N W.
● 29	29·923	·142	76·2	23½	2·2	38	·428		W S W.	27·734	63·0	56	·504		N W.	29·832	75·7		S.	68 0		(var.)
30	29·969	·046	76·7	21	0·5	43	·482		S W.	27·760	67·0	47	·395		(var.)	29·875	77·7		S.	68·0		(var.)
31	29 910	·071	71·7	16	5·0	61	·563		S W.	27·670	71·7	51	·522	0·027	S.	29·791	75·7		S.	74·0		S E.
Means	29·852	·099	76·0	20	4·7	51	·574	3·915	N 84° W	27·708	69·3	58	·595	1·761		29·745	79·6	3·348		72·3	1·601	

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

NOVEMBER, 1859.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Description of a Magnetic Apparatus for adding Adhesive Force to the Driving Wheels of Locomotives. By EDWARD W. SERRELL, Civil Engineer.

Almost all locomotives that have been built heretofore, have an excess of steam power over their adhesion, and where this is not the case, the great weight that necessarily ensues, in some cases amounting to several tons beyond what is required for the proper strength of the parts, is not only an unnecessary load to carry every mile that the engine travels, but is so much dead weight producing impact by which the track and bridges, and in fact the whole superstructure is sooner or later destroyed.

The difficulties railway companies experience are manifold from the use of heavy engines. Not only the track is destroyed, and the bridges impaired, but the machinery itself more readily wears out its own parts by their great weight, and much more lubricating material is required; but railway managers find themselves forced between the two horns of a dilemma; for if they use light engines, there is not adhesion sufficient to draw the heavy loads necessary to a profitable business; while if heavy machinery is employed, it works its own destruction and that of the track on which it moves.

The destruction of superstructure due to locomotives of great weights has been carefully computed by the learned commissioners appointed

by the States of New York and Massachusetts, and by several other eminent engineers, among whom may be mentioned my friend William Raymond Lee, who has accomplished much to put this important question in its true light, as has also Mr. McAlpine and Charles B. Stuart, and others, and it has been found that the depreciation from this cause amounts to upwards of $26,000,000 per annum in the United States alone.

Appreciating these difficulties, I went to work to see what could be done to remedy them, believing that science and experience combined could surely correct such grave errors, as there must be in a system that resulted so destructively to its own best interests, and to this end I drew upon the intelligence of all my good friends in this country, Canada, England, France, and Germany.

The replies, without exception, were, "You must increase the adhesion of the driving wheels without adding weight to the engine." This was known to be necessary; but how to do it was the difficulty; and although some encouraged the hope, and others suggested the belief that it could be accomplished by various mechanical contrivances; nothing was proposed, however, that had not before been tried, and I was about to give up the investigation of the matter, and consider the case as one of those inevitable troubles that surround every thing in some form, when reading the researches of my friend, the eminent philosopher, Dr. Henry, I was led to suppose that magnetism in some way might come to the rescue.

I was aware that attempts had been made in England to render the driving wheels permanently magnetic, and that the engineers of the *Chemins De Fer Du Nord*, in France, had tried various forms of electro-magnetic helices, but all these attempts had proved failures. I therefore set about making inquiries in this direction, from those best informed in that branch of physical science to which this subject belongs. I met, however, with little to hope from, perhaps, because of the preconceived idea, in one sense true, that a ring could not be magnetized; but struggling on, as one trying to find his way in an unknown place in the dark, and success has at last crowned the effort.

The apparatus consists of a helical coil of copper wire or some other proper electrode placed transversely to the wheel and around the lower segment, in such manner that the wheel may revolve freely within it without at any point coming in contact with it. The helix is sustained in any convenient way to the frame of the engine, and consists in the experiments tried of about 300 turns of No. 8 copper wire, insulated with cotton and marine glue.

One peculiar feature of the helix is, that it is a segment struck from a radius of the diameter of the wheel, which was found to be necessary in order that the greatest magnetic effect might coincide with the point of contact between the wheel and rail.

My first battery consisted of sixteen Groves cells, so modified that they would not stop by the motion of the engine; each cell had about 300 inches of zinc surface, and corresponding opposites of platinum and carbon, and the cells were connected in sets of eight for quantity

—zinc to zinc, &c. My present batteries are a modification of SMEES and CHESTER'S, which are found to be much more convenient.

By this arrangement, with the ordinary thickness of tire, the wheel is so magnetized as to enable the engine to exert its whole steam capacity. With two out of four drivers magnetized, of the engine "*Anthracite*," of the Fitchburg company, it was found that there was an increased adhesion of the wheels, and consequently of the traction of the engine, of over 75 per cent. The steam capacity of the engine being nearly double its adhesion without magnetism, enabled me to use the whole of the magnetic effect.

I am indebted to Mr. O. D. Vormus, of Boston, for very important aid in the experimentations, the troubles and difficulties attending which I shall not weary you with.

The engine "*Lebanon*" of the Central Railway of New Jersey, has two helices of 288 turns of No. 8 copper wire, on the front pair of the four driving wheels, which are four and a half feet in diameter, and the battery is made in four cells, each having twenty square feet of zinc surface, and eighteen feet of silvered lead coated with platinum, sulphuric acid, ($HO.\ SO_3$,) 1, water 12 is used to excite action, and the battery is connected for intensity. I am now preparing a magneto-electric machine to produce the electric current, hoping to dispense with the use of the battery altogether, and if successful, the entire arrangement will be mechanical and independent of chemical apparatus. Some of the engines of the Central Road of New Jersey, and the Erie Railroad of New York, have from three to five tons dead weight of cast iron, that can be taken off, and has been put on to give adhesion, and is otherwise useless.

This arrangement not only saves the great additional useless weight carried, and which is so detrimental to the superstructure, but enables the engine to ascend high grades. With a model, an ascent of a plane of 300 feet to the mile is readily made when the wheels are magnetized. The same model will not go up a grade of eighty feet to the mile without magnetism, because the wheels slip. The model is merely illustrative, and is capable of carrying about two hundred pounds.

The following is the test applied to the *Anthracite:*

Engine chained up.

Slipped wheels on clean track in good condition; circumstances every way favorable to traction, without magnetism, 50 lbs. steam to the inch.

All the conditions alike and two wheels magnetized, slipped with 88 lbs. of steam per square inch; slippery track, 19 lbs. less steam to the inch, without magnetism; same conditions, with magnetism, required 35 lbs. steam to the inch.

The engine weighed 22 tons net, and the additional traction produced by the magnetism was equal to 17 tons of dead weight, but did not weigh any thing.

The "*Lebanon*" drew a coal train on a slippery rail equal to that which was being moved by another engine that weighed about fifteen tons more, and both starting together, the *Lebanon* kept out of the

way of the other for some forty miles or more, when a leak occurring in the fire-box, sufficient steam could not be made to turn the wheels, and eight of the cars had to be taken off. The train had, however, previously passed the heaviest summits of the road.

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*Submarine Electro-telegraphic Experiments.**

We were invited last week to witness some interesting Experiments on the Patent Caoutchouc Telegraphic Insulator, at Messrs. Silver & Co.'s Establishment at North Woolwich. Mr. West, inventor of the India rubber covered wire, conducted the experiments, and gave an account of his researches in connexion with the process. As long ago as 1838 he commenced using india rubber for insulating wires. In 1845 he entered into an arrangement with Sir Joseph Paxton, Mr. Charles Dickens, and other gentlemen, to lay down a submarine cable between France and England, on the caoutchouc insulating principle; but, although the sanction of the English Government was obtained to the undertaking, that of the French Government was withheld for so long a period as to render it impossible to carry it out at that time. But in 1846 a portion of the cable which had been made by Mr. West to lay down across the Channel was, with the consent of the Lords of the Admiralty, submerged in Portsmouth harbor, and a letter was read from Mr. Hay, the chemical referee and lecturer attached to the dock-yard, dated May 25, 1859, in which Mr. Hay states that, notwithstanding that the cable in question has been in constant use, exposed in places to the sun, strained over rough stones, frequently coiled and uncoiled, and treated very roughly, the insulation is now quite perfect, although thirteen years have elapsed since it was laid down. A portion of this cable was exhibited. Mr. West's improvements, for which he has taken out a patent, consist in manipulating and applying the india rubber. In consequence of this substance not becoming plastic at a low temperature, it is impossible to draw it on the wire like maccaroni or gutta percha; it is, therefore, wound spirally round it; but as caoutchouc is not homogeneous, and the want of cohesion in the overlapping would render it liable to the permeation of water, Mr. West was under the necessity of inventing a method of overcoming this defect. The experiments testified that he has perfectly succeeded, and specimens of his cable, which were exhibited, showed that the india rubber is rendered perfectly solid and homogeneous. The quick and easy manner in which it can be repaired in case of abrasion or cutting is another great advantage of his process, while experiments showed that the electric fluid is transmitted without lateral loss, thereby rendering the use of batteries of great power unnecessary. It has been ascertained that india rubber insulates ten times better than caoutchouc, which is too porous to admit of perfect insulation. Care must be taken, however, to use the Para caoutchouc, as that derived from the East Indies is of an inferior quality and becomes "treacley,"

* From the Lond. Athenæum, June, 1859.

and consequently unfit to act as a good insulator. Careful experiments made to test the resistance of the india rubber covered wire to great atmospheric pressure, showed that with a pressure of 1300 atmospheres, equivalent to between two and three times that of the greatest depth of the Atlantic, insulation remained perfect. Mr. West stated that the object of the Messrs. Silver was to invite public attention to their production, with a view to having the most searching investigation into its merits,—not dogmatically putting it forth as a perfect invention, but seeking to elicit by the most open and unreserved exposition of its qualities, the truth with regard to its capabilities. The importance of the subject cannot, indeed, be overestimated —particularly at this period, when the convulsed state of the Continent has, within the last few days, led Government to decide on laying down a submarine telegraph between England and Gibraltar. Successes have been achieved by gutta percha, while on the other hand, great losses have occurred. The successes have only been on short lines, while the reverses have been on long lines, and experience seems to show that after a few years' use caoutchouc deteriorates so sensibly as to be no longer a perfect insulator.

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*A Coincident Period in American Statistics.**

By adding successively a cipher or ciphers, the figures "29,636" will express the present (1st July, 1859) sum of the railroads, post routes, territorial extent and population of the United States. Thus we have approximately:

Miles of railroad,	29,636
Miles of post-route,	296,360
Square miles of territory,	2,963,600
Mouths in population,	29,636,000

—facts exhibiting in their representative numbers a progression equivalent to our dollar, dime, cent and mill system of money; and eminently typical of American "go-aheadativeness," which abhors to do anything by *halves*. Such a concurrence of arithmetical idiosyncracies may never again occur, and never will unless our "fillibusters" succeed in enlarging "the area of freedom" in a ratio commensurate with the expansion of our population and the development of our means of internal communication.

*From the Jour. of the American Geographical and Statistical Society, July, 1859.

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*The Hydraulic Lift at the Victoria Docks.** Invented by Mr. Edwin Clark.

On Wednesday, the 27th of July, many who are interested in the progress of science had the pleasure of seeing in successful operation at the Victoria Docks Mr. Edwin Clark's method of ship-lifting, which appears likely to supersede the graving dock for many purposes. Mr. Clark's apparatus consists of a series of thirty-two upright hydraulic

*From the Lond. Mechanics' Magazine, August, 1859.

rams, of ten inches in diameter, placed in a water-way in two lines of sixteen each, far enough apart to admit of a ship of any burden passing between. Each ram is fitted with a cross-head of wrought iron, and the cross-heads are supplied with long straps, to the lower end of which are connected girders extending across from row to row. These girders, when the rams are down, are of course at the bottom of the water. The pontoon, on which the ship is raised, is formed of wrought iron plate, strongly ribbed, the length and depth of which varies according to the size of the ship it is intended to lift. This pontoon is open at the top, and is of sufficient buoyancy, when empty, to support a vessel of very large tonnage. It is fitted with screw valves for admitting the water, so that in a very short time, when placed in position, it can be lowered down upon the cross girders. The rams are fed by a 50 ℔. engine, which is fitted with twelve hydraulic pumps, $1\frac{7}{8}$th in. diameter, and 2 ft. stroke, working at 18 strokes per minute, and the pipes from these pumps, before branching off to the rams, communicate with a series of valves arranged in a place built for that purpose close to the lift. By means of eccentrics, which close the valves, any one of the rams can be disconnected at will from the supply, so that should one of the pipes burst, no danger can accrue to the ship, and the lifting process can be completed without delay.

At half-past 1 o'clock on Wednesday, the 27th, the pontoon being placed in position upon the girders, it was first filled and then lowered to the bottom of the water. After this the Jason, a ship of about 1000 tons burden, was warped in, and having been fixed in position by means of ten sliding blocks, which were pulled into contact with the sides and bottom by means of chains brought above the water line, the engine was set to work, and the whole mass rose gradually out of the water at a speed of one foot in three minutes. As the pontoon came above the surface, it relieved itself of the water it contained, and the valves being then closed, the buoyancy of the saucer itself supported the ship in a perfectly steady and satisfactory manner. The whole operation, from the beginning to the end, extended over the space of $1\frac{1}{2}$ hours, and the dead weight lifted, including the pontoon, was altogether above 1600 tons. There are four pontoons constructed, and others in course of construction, which when raised in this manner, and floated, are to be towed with their burden into shallow bricked recesses provided for that purpose, so that the hydraulic power can be continuously applied for raising purposes. During an entertainment which followed the experiment, or rather the operation, Mr. Edwin Clark laid before his audience a clear and concise description of his invention, and the obstacles he had had to contend with in bringing it to its present state of perfection.

The engraving No. 1 shows a cross section of the lift, with a ship in the act of being raised. A A are two of the columns in which the rams are placed; B shows one of the cross girders; C, the end of the pontoon; D D, two of the sliding blocks for steadying the ship; and E E are two double purchase crabs for raising weights, and lifting the rams when required. These can be run about any where upon the top platforms, and are very useful adjuncts.

Engraving No. 2 is a section, in detail, of one of the columns, showing the ram, which is lettered A, the cross-head B, the side rods C C, and the cap-plate D. It will be noticed that the hydraulic cylinder

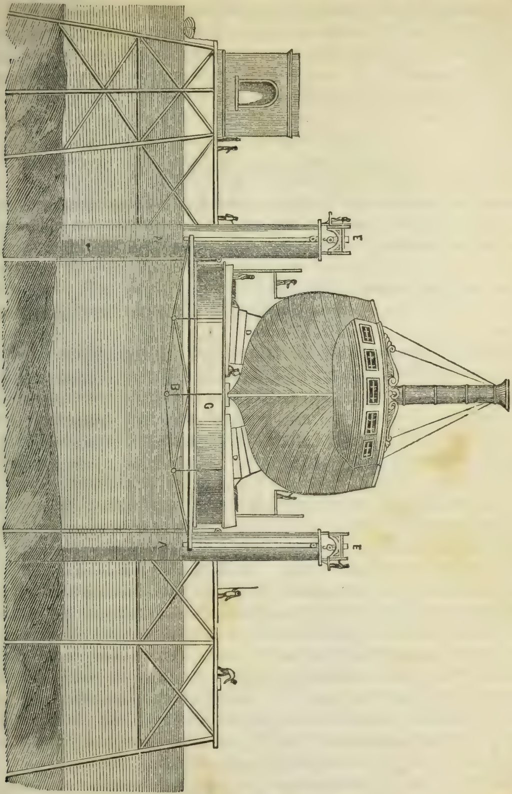
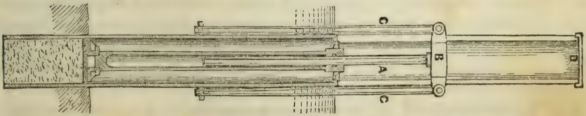


Fig. 1.

Fig. 2.



containing the ram rests upon a block of concrete, which fills up the inside of the column to the required height.

It will be needless for us to say much more upon the subject of Mr. Clark's invention. Its superiority over the old graving dock for many purposes is sufficiently manifest. Instead of a vast outlay upon excavations, masonry, and elaborate machinery in each instance, one hydraulic lift will do the work of any number of graving docks; and the only expense, beyond the first outlay, is providing an adequate number of pontoons for the work, and water space of any kind beyond three feet deep for floating them in.

Steam Engineering in 1859.*

Introductory.—No apology is required for calling attention to the present state of steam engineering, especially when it is a well-known fact that, at no previous period has there been a greater spirit of inquiry respecting the duty that should be realized from the steam engine than at the present time; indeed, it may be said, that among engineers themselves, there is a decided feeling of dissatisfaction on this point.

The following observations are entirely of a general character, preparatory to a consideration of details, and they are intended to refer to what *has been* done, what *is being* done, and what *can* be done; also how far the present state of steam engineering will compare with the days and deeds of Watt, after crediting him with the mechanical improvements of nearly a century.

In 1769, James Watt specified his three great inventions:—separate condenser; encasing the working cylinder with steam or other source of heat, to prevent premature condensation; and employing the expansive action of steam.

The title of this specification was, "A Method for Lessening the Consumption of Fuel in Fire-engines." The inventions were not merely mechanical improvements, but they were the development of the principle on which Watt based all his hopes of economy—namely, that HEAT IS THE SOURCE OF ALL POWER IN STEAM; and his aim was to prevent all needless and premature condensation, and consequent loss of power.

His correspondence also, and the nature of the inventions referred to, prove his belief that heat is the mainspring of the steam engine. The truth and correctness of that belief have been fully manifest in the experience of the period that has elapsed since 1769.

Previous to Watt's inventions, when, in Newcomen's engines, the condenser was the working cylinder itself, the waste heat in this defective system amounted to more than three-fourths of the total steam generated; and when to that waste were added other losses incidental to the generation and working of the steam in a defective machine, the result realized was a mere fraction of the power represented in the combustion of the fuel.

Watt's first invention of the separate condenser lessened the waste condensation to a great extent; his second invention of encasing the

*From the Lond. Artizan, May, 1859.

working cylinder with steam, &c., was only an extended application of the principle of the first; and his third invention of using the expansive action of steam, could only be applied with success in combination with the other two: indeed, they are such a united trio that, in condensing engines, neither can be dispensed with without involving a considerable loss of effect, even when working with steam of only atmospheric pressure.

It is not a doubtful but a well proved fact, that steam cannot be deprived of its temperature, without a proportionate loss of its pressure; it is also a well known fact, when steam of a certain temperature, say 250°, is brought into contact with iron, wood, or air, having a temperature of say 80° only, there is a constant action going on proportionate to the conducting powers of the low temperature material, by which the steam is deprived of a portion of its heat and pressure, and the loss thereby increases rapidly with the difference between the two temperatures.

As a homely illustration on this point, we may refer to the effect of different temperatures in the case of the human body and the atmosphere in which it may exist. In the human body, the average temperature is 90°, and we find that we cannot remain in a surrounding temperature of 32° without losing a considerable portion of our sensible heat.

The amount of the loss, by conduction and radiation, in the steam engine, is dependent on many circumstances. It is enough at present to draw attention to the fact that there is a loss, and that a considerable one.

To the appreciation of the importance of preserving the heat in steam intact, was due, to a great extent, Watt's success as an improver of the steam engine, and, whenever such preservation is neglected, loss and partial failure are inevitable.

It is not assumed that any new ideas or facts are developed in the preceding remarks; they are only intended to direct attention to those true principles of economy in the development of steam power, without which that economy is impossible, and one reason for referring to what may be termed first principles is, that we may have to trace present defects to their neglect.

There must, of necessity, be a difference between the results of theoretical calculation and those of practical experiment, but it is not a necessity that the amount of that difference should average more in 1859 than in the days of Watt, after crediting him with the advantages of mechanical construction we now possess.

It is to be feared that these mechanical advantages are more than counterbalanced by neglect of the true principles of economy in the use of steam, and that we are utilizing a smaller per centage of the total power of steam than Watt himself.

In these introductory remarks we shall not refer to certain sources of loss in the *generation* of steam, or to those arising from the difficulty of utilizing the heat in the condensed or exhausted steam; these will be referred to on a subsequent occasion.

We may fairly compare the duty of the steam engine, as improved by Watt in 1769, with the average duty realized by steam engines now in general use; and we will only notice *exceptive* cases when they prove that an increased duty is both possible and practicable.

There are three separate classes—the professional, manufacturing, and the purchasing—immediately interested in the construction of a steam engine, each of which has its own particular influence.

The professional engineer is comparatively of a late creation, and his influence is quite subservient to that of the manufacturer or the purchaser; his position and success in life are, to a great extent, dependent upon his opinions being somewhat in advance of the age, and if he unites a fair amount of scientific knowlege with sound practical experience, he will not encourage the perpetuation of unsound and defective engineering; his responsibility and power are at present very limited, and it would be unjust to blame him for departures from true principles, when such have been the result of circumstances over which he had no control.

The manufacturing engineer has to satisfy the claims of what are too often opposite and conflicting interests. On the one hand he is supposed to supply the market with the best description of steam engines, and on the other he has to make money, and avoid what may be called needless expenditure in producing his goods; he is also influenced by the opinions and requirements of his customers.

Now it does not follow that in manufacture the *cheapest* is the *best*; on the contrary, it is too often the other way, for it is well known, to produce an article at a cheap rate, and make the sale of it profitable, repetition must be encouraged, and alteration avoided.

To take an instance: in manufacturing a steam engine a certain outlay is required for patterns, and when it is purchased at the market price for engines of a certain class and size, in a general way, that price is not affected by the cost of the patterns; but it is of every consequence to the manufacturer, as a matter of profit or loss, whether that cost is debited to one engine or to twenty; it follows, therefore, that, in this instance, there is in the process of manufacturing steam engines a great inducement to repetition, in opposition to the more important demand for improvements tending to economy and general efficiency. And we may add, there is little hope of an immediate change in a system that, unfortunately, opposes such a strong barrier to real improvements, for the reason that a manufacturer will not ruin himself to benefit his customer.

We must look to the increasing intelligence among the purchasers and users of steam power for the change required, the influence exercised in the production and quality of steam power by the third or purchasing class being greater than is generally supposed. The man who holds the purse-strings is the man of influence, and the engineering character of the manufacturer has been, and always will be, greatly changed and modified by that of the purchaser.

Such a state of depressed improvement is not to be submitted to without a murmur, nor is it at all evident that great changes for the

better could not be made if the manufacturing engineer was more constantly and pointedly to enlighten the dark understanding of his customers.

The best interests of the employer of steam power are, in truth, identical with the purchase and use of the best and most economical machinery; and we believe the manufacturing engineer will ever prefer to lead the van in efficiency and economy, if he is allowed a fair profit on his manufactures.

And now, having stated *some* of the drawbacks to extensive improvements in the production and use of steam power, we wish to call attention to the actual efficiency of the steam engine of 1859.

We have previously referred to the three inventions specified by Watt in 1769, and we propose to inquire what actual duty *has been realized* in engines, constructed in accordance with the principles of that specification.

The first practical application of steam power was for the purpose of pumping, and in no class of engine have economical principles of construction received such attention as in that used for removing water from deep mines; and it may be observed incidentally, with reference to the expansive action of steam, it was peculiarly adapted to the conditions of pumping, where great variation of power was requisite.

In Cornwall the duty performed by pumping engines has been regularly tabulated for some years, and the amount of that duty has, in several instances, amounted to upwards of 90,000,000 lbs., raised 1 ft. high in an hour, with a consumption of a bushel of coals, or 94 lbs.; and if to the above duty is added the friction of the engine and pumps, an indicated or actual power has been, and can be, obtained by the consumption of *less* than 2 lbs. of Welsh coal per hour.

The average duty of a number of engines working at different rates of expansion in Cornwall may be much less than the above; but whenever due attention is paid to the maintenance of the heat of the steam in the cylinder, and full scope is allowed to expansive working, the above economy can always be realized.

In the case of condensing engines, for driving mills and manufactories, in which steam jackets and expansion have been combined, an indicated or actual horse power has been obtained, without difficulty, with a consumption *not exceeding* 2½ lbs. of coal per hour.

We therefore maintain that, by attending to the principles of Watt's specification, an indicated or actual horse power can always be obtained from a well made steam engine, on land or on sea, by a consumption of good steam coal *not exceeding* 2½ lbs. per hour; and we are aware that this statement is more moderate than well established facts require; indeed, there is every reason to believe we might fairly adopt a much higher standard of economy.

As a concluding remark on this part of the subject, in no instance on record has the best result or highest duty been realized without special arrangements for maintaining intact the temperature of the working steam and extensive expansive action.

Our next inquiry is:—What is the *average* duty realized at the pre-

sent time on land and on sea for the consumption of a given amount of coal? In reply to this, the following may be fairly assumed as undisputed facts:—

1. That, with land condensing engines, the average consumption of good steam coal per hour, to obtain an indicated or actual horse power, is *not less* than 4 lbs.

2. That, with marine engines of the best general construction, made by first class firms, the consumption of good steam coal per hour, necessary to obtain an indicated or actual horse power, is *not less* than $4\frac{1}{2}$ lbs.

3. That, except in a few instances, no provision is made for *maintaining the temperature of steam* in the steam pipes and passages, and during its expansion in the cylinder, either in land or marine engines.

4. That the advantages derived from the expansive action of steam when the temperature of the steam is *not* preserved, are often so slight as to throw discredit on a principle which, when properly applied, is invaluable in economizing fuel.

The conclusions to be drawn from the above are far from satisfactory, and quite justify the tone of these introductory remarks.

The steam engineering of 1859 is in a most defective condition, and the results of such deficiency are incalculable.

In steamships alone we have at least one and a half millions of actual or indicated horse power; and if we only suppose this power to be exerted during one month out of the twelve, we are needlessly throwing away fuel to the amount of 100,000 tons per annum.

Figures and calculations must fail to convey a correct estimate of the loss incurred by defective steam engineering; and in the case of steam shipping, the actual amount of fuel saved is only a portion, and sometimes a small one, of the saving in freight, &c., resulting from coal space available for cargo.

The astonishment expressed at the economy resulting from the use of superheated steam indicates, only too truly, how far we have departed in practice from the first principles.

The facts, that the advantages to be derived from superheated steam can be obtained at a comparatively small outlay, and that its application is easy to existing machinery, will go far to bring it into favor; but it is matter of serious doubt if an improvement that is based on the existence of a previous defect is the *best of the kind.*

The economy resulting from superheating steam must convince the most sceptical that in all engines—where the cylinders are merely clothed to prevent radiation—at least from 20 to 30 per cent. of steam is needlessly condensed during its passage from the boiler to the condenser, and it is the surplus heat supplied from the superheated steam that prevents this waste, and saves the fuel.

We are but *entering* the field of improvement in steam engineering, and the amount of duty realized from the combustion of a pound of coal is at present but a small per centage of the total value of the heat given out by that coal.

Boilers, engines, condensers, must all be greatly improved; for each

has its peculiar source of waste, the sum total of which is well known to be considerable.

We have thus, as it were, just glanced at the state of steam engineering in 1859, being conscious of omitting mention of many incidental causes for present defects. When we proceed to refer in detail to steam engine construction, the opportunity will be afforded of embracing all points of interest.

(To be Continued.)

Formula and Table for Proportioning Arches of Wood or Cast Iron for Bridges. By John C. Trautwine, Civ. Eng., Philadelphia.

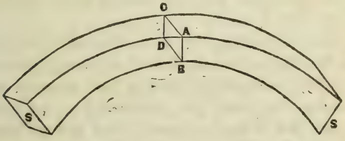
To the Editor of the Journal of the Franklin Institute.

The following formula, rules, and table, for deducing readily the dimensions of wooden or iron arches for bridges, were originated by myself for my private use; but supposing that they might occasionally prove serviceable to other members of the profession, I submit them for publication in your *Journal*, in case you entertain the same opinion.

In wooden bridges in which the entire dependence for supporting the weight of both the structure and the load, is placed upon the curved ribs or arches; the rise of which neither exceeds one-fourth, nor falls below one-twentieth of their span; the formula

$$\left(\frac{\text{SPAN}}{4} \div \sqrt{14{\cdot}6 \text{ rise} - \frac{\text{SPAN}^2}{2125}}\right) + \left(\frac{\text{RISE}}{2000}\right)$$

Fig. 1.



will be found to give the side *a b* or *a c*, Fig. 1, of a single arch of any span whatever, which is square at its crown *a c;* and which, when completed by properly increasing its cross-sectional area from the crown towards the springs, or skewbacks *s s*, (by a simple process which will soon be described,) will sustain, *besides its own weight*, (estimated at 30 pounds to a cubic foot) a uniformly distributed load of $1\frac{3}{4}$ tons per foot lineal of span; and at the same time will not, in any part of its length, be subjected to a compressive strain exceeding about 800 lbs. per square inch; in no case varying more than 10 or 12 pounds from that limit.

With so trifling a deviation from exactness as 10 or 12 lbs. in 800, the formula may therefore, so far as regards its *practical* application to bridge arches, be considered as mathematically correct.

It will be observed that the single arch derived from this formula contains the *total area* of arch at crown required for the bridge. Of

course this arch will in practice be subdivided at least into two; each of which will present half the area of the calculated single one.

The formula is manifestly applicable also to those numerous plans of bridges in common use, which consist of trusses variously framed, but depend upon a straight upper chord for resisting compressive strains. It gives the *entire* area at centre of the upper chords, for a load of $1\frac{3}{4}$ tons per foot lineal, omitting the weight of the chords.

The arch is, of course, supposed to be so braced as to resist change of form from passing loads.

About 800 pounds per square inch is the limit assigned by our most eminent designers and constructors of bridges, as the perfectly safe compressive resistance of white and yellow pines and spruce,* which are the timbers almost exclusively employed for bridge arches; and the assumption has been very abundantly sustained by experience.

According to Hodgkinson, (the most reliable authority on the subject,) the ultimate resistance of white and yellow pines and spruce to crushing, is about from 5400 to 7000 pounds per square inch; consequently our limit is but from $\frac{1}{7}$ to $\frac{1}{8}$th part of the ultimate strength.

As to their weights, white pine is somewhat lighter than the others, but inasmuch as their averages when seasoned, generally range between 27 and 33 pounds per cubic foot, we shall not affect the truth of our results appreciably, if we assume each at 30 pounds, as I have done.

The formula reduced to words furnishes the following

RULE

For arches of any span whatever; with rises from $\frac{1}{20}$ to $\frac{1}{4}$th the span.

Square the span in feet. Divide this square by 2125. Subtract the quotient from 14·6 times the rise. Take the square root of the remainder. Divide $\frac{1}{4}$th of the span by this square root. To the quotient add the rise divided by 2000.

The sum will be *a b* or *a c*, Fig. 1, in feet, for an arch of spruce or white pine; and the area *a b c d*, as well as every other cross-sectional area of the arch, will be strained about 800 pounds per square inch by the weight of the arch itself, in addition to a uniformly distributed load of $1\frac{3}{4}$ tons per foot lineal of span, after the arch shall have been so enlarged from the crown towards the springs, *s s*, Fig. 1, as to equalize the pressure per square inch in all its parts.

When the rise exceeds one-fourth of the span, the strain per square inch of area as deduced from my formula becomes sensibly less than 800 pounds per square inch; and in a semi-circular arch is reduced to about 770 pounds.

Even this *extreme* want of coincidence is an approximation sufficiently close for all practical purposes; and proves that so far as *utility* is concerned, the formula will apply to rises from as low as $\frac{1}{20}$ to $\frac{1}{2}$ the span. Rises greater than $\frac{1}{4}$th the span have not been introduced into the table however. Not only because that rise is very rarely exceeded, but because I wished to maintain a practically perfect consistency throughout its extent. As it is, it far exceeds any limits that have yet been attempted.

*White pine is in England called Weymouth pine; and spruce, white fir or deal.

Now the strain at the centre of a bridge (whether the bridge consist essentially of an arch of wood, iron, or stone; or whether its dependence for resisting crushing strains is placed in straight upper horizontal chords;) is a purely *horizontal* one; and this *horizontal* strain is *uniform throughout the arch.*

In any of the foregoing cases this *horizontal* strain may be very readily computed.*

Fig. 2.

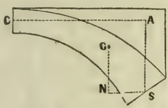
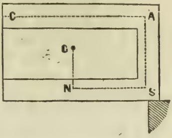


Fig. 3.



Each half of the span constitutes a lever, Figs. 2 and 3. It tends to fall by revolving on its fulcrum S, with a force represented by its weight multiplied by the *horizontal* distance *n s* of the centre of gravity G of that weight, from the fulcrum *s*, which distance is the leverage through which said weight acts. And it is prevented from falling by the counter-pressure of the other half, which acts horizontally against it at C, with a force represented by its weight multiplied by *n s*, and divided by the *vertical* distance *s a* from the fulcrum to C.

Hence the simple rule: Take one-half the sum of the entire weight of the bridge itself, and of its maximum distributed load, (making due addition for momentum.) Multiply this half sum by the *horizontal* distance *n s* of the centre of gravity G, of this half weight of bridge and load from the fulcrum or skewback *s*. Divide the product by the rise, or vertical distance *s a* from the centre of the fulcrum *s*, to the centre C of the depth of the arch or chord at the crown. The quotient will be the *horizontal* strain at C; and this horizontal strain in *the case of the arch* remains *uniform* throughout its whole extent. In the straight chord it does not; but we are not considering this subject.

In bridges of wood or iron, the distance of the centre of gravity of the half span and its load from the abutment at C, will usually be so nearly equal to $\frac{1}{4}$th of the clear span, that we shall not err materially in assuming it at that quantity, as I have done in my formula; but in stone bridges the position of the centre of gravity will be nearer the abutment, and must be ascertained previously to making the calculation. So much for the *horizontal* thrust, the only one sustained at C.

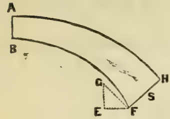
But at each skewback, or spring, *s*, the arch, sustains not only a horizontal force equal to that at the crown, but also a *vertical* one, arising from and equal to, the half weight of the bridge and its maximum distributed load, momentum, &c.

Consequently the cross-sectional area of the arch at the spring must be greater than that at the crown; and must bear to it the same ratio

* See Whipple on Bridge Building, Utica, New York, 1847; Haupt on Bridge Construction, and Bow on Bracing; both 1851; three of the best authorities on the subject.

that the resultant of the horizontal and vertical pressures at the spring bears to the horizontal pressure alone at the crown.

Fig. 4.



So long as the *thickness* of the arch remains uniform, if we take its *depth*, *a b*, Fig. 4, at the crown, to represent the amount of pressure at the crown, then will the depth *f h* at the spring, of a properly proportioned arch, represent the pressure at the spring.

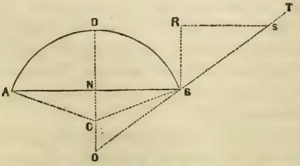
Therefore, if from the point *f*, we draw the horizontal line *f e*, equal to *a b*, and representing the horizontal thrust; and the vertical line *e g*, by the same scale, to represent the half weight of the bridge and load, then will the resultant line *g f* represent both the total *amount* of pressure on the skewback, and its *direction*. And *f h*, drawn at right angles to *f g*, and equal to it, will represent the proper length and direction of the skewback joint.

The same result may be readily arrived at by calculation, thus: In any right angled triangle, as *e f g*, the hypothenuse *f g*, which represents the strain at the skewback, is equal to the square root of the sum of the squares of the two sides *e f* and *e g*, which respectively represent the horizontal and vertical pressures at the skewback. In other words, if we add together the square of the horizontal pressure, and the square of the half weight of the bridge and its maximum load, and extract the square root of the sum, we obtain the entire strain at the skewback.

It is plain, that to ascertain the depth of an arch by this means, is a process of successive trials; because in order to know the strains produced in an arch, we must first know its dimensions and weight; but to obtain its dimensions and weight we must first know to what strains it is to be subjected. It is necessary, therefore, as a preliminary step, to assume certain dimensions, and from them to calculate the weight, and the strains resulting therefrom. If these calculated strains prove to be too large, or too small for the assumed arch, new dimensions must be fixed on, and a new trial made, until the required coincidence is secured.

The following very simple method of my own, possesses all the accuracy required in practice, and when used in connexion with my formula, gives the proper result at once.

Fig. 5.



Describe a small arc *a d b;* draw *a b* and *n d* proportioned to each other as the span and rise of the arch under consideration. In *d n* continued

through the centre c, from which the arc was described, make $c\ o$ equal to half of $n\ d$. From o, through b draw $o\ t$. Then is $b\ t$ the *direction* of the skewback.

Next make the vertical line $b\ r$ (by any convenient scale, without regard to the scale of the arc $a\ d\ b$) equal to the depth of the arch at the crown as deduced from my formula (as hereinafter explained).—Draw $r\ s$ horizontally, intersecting $b\ t$. Then, $b\ s$ measured by the same scale as $b\ r$, will give the length of the skewback, such that the pressure per square inch through the entire length of the arch will be the same. The *thickness* of the arch being supposed equal to the *depth* at the crown, and to be uniform throughout from crown to springs, it follows that the depth $b\ s$ of the skewback multiplied by the thickness of the arch will give the cross-sectional area of the arch at the skewback.

It is only while thus obtaining the areas of cross-section of the arch, that it is necessary to suppose the arch to be of equal *thickness* throughout. Having once obtained the areas at crown and springs, the form into which these areas shall be thrown must depend on the judgment of the engineer, and will be affected by the nature of the material employed in the arch. If of wood, the cross-section will most probably be rectangular; but if of cast iron it will be made either **T**, **H**, or **O** shaped; or may receive whatever figure may be supposed best adapted to the peculiar case.

I repeat that the single arch found by the above process contains the *entire* area required for the bridge; and will be subdivided into two or more smaller ones, in each of which the areas at crown and springs must bear to each other the same proportions as in the large one.

The accompanying Table is intended to supersede to some extent the necessity for entering into a detailed calculation of the size of arch required in any particular case. It has been prepared from my formula. Therefore, when in any case it is found that the total weight to be supported by a wooden arch amounts to $1\frac{3}{4}$ tons per lineal foot of span equally distributed, (omitting the weight of the arch itself only,) the Table at once gives by inspection, the depth of arch at the crown; and since the thickness at that point is *supposed* to be equal to the depth, it follows that the square of the depth gives the *total* area of cross-section required at the crown. The depth at the crown being obtained, that at the skewback can be found in a few moments by employing the method illustrated by Fig. 5.

Thus, let us suppose that a single track railway bridge of 150 feet span, and with a rise of 15 feet, or $\frac{1}{10}$th of the span, has been designed, with the exception of determining upon the dimensions of arch required; and that the weight of the floor, bracing, and all other parts of the structure itself, *except the arches*, amounts to the quantity usual in such a bridge, of about ·45 tons per foot run of span; also, that the equally distributed weight of maximum extraneous load, including engine and train, snow, the effects of momentum, &c., be taken at 1·3 tons per foot run, (which I consider a fair allowance); making in all 1·75 tons per foot lineal to be supported by the arch. Now, what must be the dimensions at crown and skewback of one single wooden arch,

which by itself shall support this load safely, and not be strained in any part by a greater crushing pressure than about 800 lbs. per sq. inch?

We see at once by the Table, that the *entire arch area at* the crown must be $2{\cdot}607 \times 2{\cdot}607$ ft. $= 6{\cdot}80$ sq. ft., or $(6{\cdot}80 \times 144)$ 979 sq. ins.

Then to find the entire arch area at the skewback, describe any small arc, (3 or 4 inches long will answer very well) as $a\,d\,b$, Fig. 5, of which the chord $a\,b$ is equal to ten times the rise $n\,d$; that being the proportion in the present instance, of span to rise. Make $c\,o = \frac{1}{2}\,n\,d$; through o and b draw $o\,t$: make $b\,r$ vertically by any convenient scale, (without reference to the size of the arc,) to represent the centre depth, 2·607 feet. Make $r\,s$ horizontal; then will $b\,s$ be the *direction* of the skewback; and, measured by the same scale as $b\,r$, will be found to be 3·35 feet, the required *depth* of arch at the skewback.

Since the arch is *supposed* to be of equal *thickness* throughout, it follows that the *entire* cross-sectional area of arch required at the skewbacks is $2{\cdot}607$ ft. $\times 3{\cdot}35$ ft. $= 8{\cdot}733$ sq. ft., $= 8{\cdot}733 \times 144$, or 1257·6 sq. ins.

Consequently, the single track railway will, in this case, require two arches, each of which shall have a cross-sectional area at crown of $\frac{979}{2} = 489\frac{1}{2}$ square inches; and at skewback of $\frac{1257{\cdot}6}{2} = 628{\cdot}8$ sq. ins.

As before remarked, these *areas* may be disposed into such *forms* of cross-section as the judgment of the engineer may suggest.

At half way between the crown and skewback, measured along the chord or span of the arch, the area should be equal to half the sum of the areas at those two points; and so at any other intermediate point, a similar mode of proportioning should be observed.

Before closing this paper, I will work out in detail an example to show the correctness of the formula.

At present, I shall confine myself to explaining certain points necessary to be understood in order to render the table more generally useful in practice.

In the first place, as regards bridges whose combined weights (omitting in all cases the weight of the arches themselves,) and loads amount to more than $1\frac{3}{4}$ tons per foot lineal of span; as generally begins to be the case when the span much exceeds 150 feet.

The mode of proceeding in this case is very simple; and its principle self-evident. We have only to obtain the areas at crown and spring as if the load were but $1\frac{3}{4}$ tons per foot of span, as in the preceding example; and afterwards to increase them respectively in the same proportion as the increased total weight (omitting the arches,) per foot run exceeds $1\frac{3}{4}$ tons.

For instance, if in the preceding example, the arch had been required to sustain a weight of $2\frac{1}{4}$ tons per foot, instead of $1\frac{3}{4}$, we should have found the areas at crown and spring, precisely as was done; and afterwards have enlarged them for the $2\frac{1}{4}$ tons, thus:

Tons.		Tons.		Area at crown.		Area at crown.
1·75	:	2·25	: :	979	:	1258·6* sq. ins., for the new arch.

And,

Tons.		Tons.		Area at spring.		Area at spring.
1·75	:	2.25	: :	1257·6*	:	1616·9 sq. ins., for the new arch.

* This close coincidence was entirely accidental.

The engineer sometimes wishes to form at the moment an *approximate* idea of the size of arch required for a certain span, without the trouble of a previous calculation in detail of the dimensions and weights of the several parts of the structure; and I have endeavored to render my table subservient to this end, in the following manner.

I find by analyzing some of our best single track wooden bridges of about 150 feet span, that the weight of the structure itself (omitting the weight of the arches,) averages about ·45 ton per foot run of span; and that of this ·45 ton, about ·3 of a ton may be considered as invariable, without regard to span; while about ·15 ton increases, *per foot run* of span, nearly as the squares of the spans.

On this basis we have as the total weight per foot run of bridge and load, when the bridge is single track, and about 150 feet span, as follows (omitting the arches):—

·30	of a ton, invariable, or independent of span.
·15	of a ton, varying in other spans, nearly as the squares of those spans.
1·00	ton weight of train.
·30	of a ton allowance for momentum, snow, &c.
1·75	tons total weight per foot run of bridge (omitting the arches), and of maximum extraneous load.

Thus we see that of the 1·75 tons per foot run of a bridge of 150 feet span, only ·15 ton, or about $\frac{1}{12}$ part, must be considered as variable in calculating the weights corresponding to other spans. But inasmuch as this $\frac{1}{12}$th part increases as the *squares* of the other spans, it amounts to a serious item when the spans become very large.

In a span of 200 feet it will be thus:—

(Square of 150.)		(Square of 200.)				
22500	:	40000	: :	·15 ton	:	·222 ton,

making the total *approximate* weight per foot run of span as follows:

·3	tons	invariable weight.
·222	"	variable nearly as squares of spans.
1·00	"	weight of train.
·3	"	momentum, snow, &c.
1·822	tons	total per foot run in a span of 200 feet,

or $\frac{1}{24}$th part greater than in a span of 150 feet.

Therefore, when it is desired to ascertain *approximately*, by mere inspection of the table, the total cross section of arch at the centre of a span of 200 feet, so as not to be strained more than 800 lbs. per square inch, we must either add to the tabular *depth* its $\frac{1}{24}$th part, if we do not choose to subject the arch to a greater pressure than 800 lbs. per square inch; or we may employ the tabular depth itself in case a pressure per square inch of 800 lbs. $+ \frac{800}{24} = 833$ lbs. per sq. inch, is not considered too great. I say the *depth* only need be increased in making the calculation; because, as the *thickness* of the arch is *supposed* to remain uniform, the cross sectional area will increase in the same proportions as the depth.

By the same process, I find that for spans greater than 150 feet, we

must either increase the areas at crown, as deduced from the table in the following ratios, of column "depth"; or, by adopting the tabular results, subject the arch to the pressures per square inch given in column "pressure."

	Depth.	Pressure in lbs. per sq. in.
For 200 span,	1·24	833
" 250 "	1·7	915
" 300 "	$\frac{1}{4}$	1000
" 350 "	·38	1104
" 400 "	·52	1216

Those, therefore, who do not consider 1000 lbs. per square inch as too great a strain, may use the tabular dimensions even for spans of 300 feet for railroad purposes. I, however, adopt Mr. Haupt's safe limit of 800 lbs.

These remarks are not intended to supersede calculation. The results to which they lead are necessarily, to some extent, incorrect; still they may be very useful when want of time prevents us from entering into a close computation, or where great accuracy is not required. We may, by this means, decide instantly upon the safety or otherwise of a bridge to which our attention may be directed; and where it is not essential to know the precise amount of strength. The ·15 of a ton per foot, which I have supposed to be *variable* in a span of 150 feet, must evidently depend in practice upon the design adopted for the bracing, &c.: —the height of the bridge—whether it is covered or not, &c.

For arches between about 100 and 150 feet span, the tabular values will be found to correspond very closely with the actual weights which occur in ordinary practice; and will need little or no modification in bridges of the usual forms of construction.

In the case of arches of *less* than 150 feet span, it would be natural to infer that inasmuch as the *variable weights* per foot run will *diminish* in such arches in the same proportion as the square of 150 bears to the square of the smaller span, therefore, the cross sectional *area* of the lesser arches themselves should diminish in the same proportions.

And if in small arches, as in moderately large ones, there were no other considerations to be attended to than their ability to resist with equal safety the simple horizontal and vertical strains hitherto referred to, such would be the case:

But in practice there are certain counteracting circumstances which render it expedient to increase rather than to diminish the proportional cross sections of arches, as their spans become shorter than about 100 ft.

It is easy to see that in the case of a 20 feet span, a very large and heavy locomotive, with the greater portion of its weight concentrated upon one or two pairs of driving wheels, and having these wheels near the centre of this short span, would be much more strained *per foot lineal of span*, than would a larger bridge having its floor covered from end to end with similar engines; and that it would consequently require a stronger arch than our assumed maximum load would assign to it.

Again, in small arches, the tabular dimensions become reduced to

such an extent, that, although they are unquestionably sufficient to sustain the deranging forces which have entered into our previous considerations; still it becomes very difficult so to arrange the shape of their cross sections as to secure the structure against the *lateral* forces to which it is exposed. And, moreover, the joints become so narrow that a very slight derangement of their parts will produce an inequality of bearing, and an undue excess of strain upon very small resisting areas, so as to endanger the splitting or splintering of the joints, and lead to the destruction of the work.

These remarks apply with peculiar force to small arches of cast iron. Suppose such an arch to have a thickness of bearing joints of but about $\frac{1}{2}$ an inch, or even less, as is very frequently the case. Here a displacement of but $\frac{1}{8}$th or $\frac{1}{4}$th of an inch, arising from any accidental occurrence, at once reduces the area of bearing surface to $\frac{3}{8}$ths or $\frac{1}{2}$ of that for which it was calculated, and renders the bridge unsafe. Moreover, when the parts become very reduced in thickness, they are too much exposed to injury from very slight blows inflicted either by evilly disposed persons or by accident.

These are not merely supposed cases;—I have witnessed them all in more than one instance; and although they are, to some extent, independent of the theoretical considerations which usually enter into the calculations for proportioning the parts of a bridge, still they are of sufficient importance to demand the attention of the practical bridge builder.

From the peculiar nature of the case, it is of course impossible to do more than assign certain arbitrary limits; leaving it to the judgment of the practitioner to vary them as he may see proper.

I can, however, confidently propose the following process, as giving, in my opinion, results which will be found satisfactory.

In arches under 100 feet span, let the cross sections, as deduced from my Rule and Table, be increased as follows:—

Divide the tabular depth by the quotient of the span divided by the rise. Multiply the quotient by 100. Divide the product by the span. Add the result to the tabular depth; letting the *thickness* remain as before.

This method gives for a span of 20 feet, with a rise of 5 feet, or $\frac{1}{4}$th of the span (and which has the smallest area comprised in the table), a depth of 1·325 feet, and a breadth of ·589 feet; or a total centre cross sectional area of arch of ·7804 sq. feet, or $\cdot 7804 \times 144 = 112\cdot 4$ sq. ins. This will be divided into two arches, each of 56·2 sq. ins. area.

On the application of my Rule and Table to cast iron, it must be borne in mind that white and yellow pine and spruce weigh about 30 lbs. to a cubic foot, while cast iron weighs about 450 lbs. to a cubic foot, or 15 times as much.

The safe compressive resistance of white and yellow pine and spruce, is about 800 lbs. to a sq. in., or $\frac{1}{8}$th of its ultimate resistance of 6400 lbs.

The safe compressive resistance of cast iron is about 12,000 lbs. to a sq. inch; or $\frac{1}{8}$th of its ultimate resistance of 96,000 lbs. per sq. inch.; or 15 times as great as that of pine or spruce.

Therefore, a cast iron arch of the same span and rise as a wooden one, but of only $\frac{1}{15}$th the area of cross section of the wooden one, will weigh the same and be as strong as the wooden one, so far as respects its resistance to the crushing forces which we have considered.

Hence, nothing more would be necessary in applying my formula to any cast iron arches, than simply to calculate it first as if a wooden arch were intended, and then to take $\frac{1}{15}$th *the* area of cross section; but that on account of the greater brittleness of cast iron, and its inability to compress as wood does, and make close joints with equal bearings throughout, together with the reasons before assigned in alluding to cast iron arches, some increase of area is required; and I propose to use but $\frac{1}{8}$th of the area of wooden arches for cast iron ones—thus exposing the metal to but $\frac{1}{16}$th part of its ultimate crushing resistance. And I do not consider this more safe for iron bridges, than wood at $\frac{1}{8}$th of its ultimate resistance; and am confident that small cast iron bridges, calculated on the exact basis of the resistance of that metal to crushing as compared with wood, would be positively dangerous.

My Rule accords very well with several cast iron bridges of spans of about 30 feet, erected in the vicinity of Philadelphia; and which have for years borne the incessant passage of heavy engines and trains without evincing the slightest distress.

The most venturesome iron bridge of small span that has come under my notice was a city street bridge, dependent entirely upon *wrought* iron arches, 32 feet span, 6 feet rise, and 15 feet apart. Each arch presented a cross section at the centre of but $5\frac{1}{4}$ sq. inches. Whereas, my Rule gives for cast iron (which has about $\frac{1}{2}$ more resisting power than wrought,) 10 sq. inches, together with an increase to 13 sq. ins. toward the spring, which the bridge in question had not. Assuming the safe resistance of cast iron at 12,000 ℔s., and of wrought at 8000 ℔s. per square inch, which is near the truth, my Rule gives 3·7 times the strength of the bridge in question.

I have referred to these bridges of small spans more fully than I should otherwise have done, from the fact that my Rule gives results so small in comparison to the usual practice of European engineers, that its sufficiency for practical purposes might be doubted by some.

Some bridges by eminent English engineers, contain 6 or 8 times the quantity of metal that is necessary for the utmost safety; and evince either an extravagance, or a want of attention to details, that would ruin any American engineer.

Notwithstanding this waste of material, the failure of cast iron bridges of quite moderate spans is by no means an unfrequent occurrence in that country; while in the United States, no single instance of failure has, I believe, ever yet occurred. All our cast iron bridges, from spans of about 200 feet down, perform fully the duty required of them; and prove that in the *science* of that department, our engineers are not behind those of any other country. So far as my professional reading enables me to form an opinion, the bridges of Bollman in Baltimore; Murphy in Philadelphia; Haupt, Whipple, and others, evince a far nicer combination of the requirements of theory, with those of practice, than any others that have fallen under my notice.

TABLE—Showing the breadth, or the depth in feet at the crown of a single arch of yellow, or white pine, or spruce, so proportioned that when properly enlarged from the crown to the springs, it will sustain, *in addition to its own weight*, an equally distributed load of $1\frac{3}{4}$ tons, (or 3920 pounds) per foot lineal of its span; and which load will produce throughout the entire extent of the arch, a uniform compressive strain of about 800 pounds per square inch of its cross-sectional area.

These breadths and depths at the crown are deduced from the formula

$$\left(\frac{\text{SPAN}}{4} \div \sqrt{14{\cdot}6\ \text{RISE} - \frac{\text{SPAN}^2}{2125}}\right) + \frac{\text{RISE}}{2000} = \text{either breadth, or depth at crown.}$$

SPAN IN FEET	RISE $\frac{1}{4}$ SPAN.	RISE $\frac{1}{5}$ SPAN.	RISE $\frac{1}{6}$ SPAN.	RISE $\frac{1}{7}$ SPAN.	RISE $\frac{1}{8}$ SPAN.	RISE $\frac{1}{9}$ SPAN.	RISE $\frac{1}{10}$ SPAN.	RISE $\frac{1}{12}$ SPAN.	RISE $\frac{1}{14}$ SPAN.	RISE $\frac{1}{16}$ SPAN.	RISE $\frac{1}{18}$ SPAN.	RISE $\frac{1}{20}$ SPAN.
20	·589	·657	·720	·777	·831	·881	·929	1·019	1·101	1·178	1·250	1·318
30	·722	·807	·882	·950	1·019	1·081	1·141	1·251	1·342	1·446	1·520	1·620
40	·835	·932	1·021	1·102	1·179	1·252	1·320	1.447	1·561	1·674	1·778	1·875
50	·935	1·044	1·144	1·234	1·321	1·403	1·478	1·621	1·753	1·877	1·993	2·105
60	1·025	1·146	1·255	1·345	1·449	1·524	1·623	1·779	1·924	2·062	2·190	2·313
70	1·108	1·238	1·356	1·464	1·567	1·664	1·754	1·920	2·083	2·232	2·372	2·507
80	1·186	1·326	1·451	1·568	1·678	1·782	1·879	2·063	2·232	2·392	2·544	2·688
90	1·259	1·407	1·541	1·653	1·781	1·894	1·997	2·193	2·374	2·546	2·707	2·862
100	1·330	1·485	1·627	1·758	1·881	1·998	2·109	2·316	2·509	2·690	2·862	3·027
125	1·490	1·666	1·824	1·972	2·111	2·244	2·368	2·603	2·822	3·029	3·226	3·414
150	1·637	1·829	2·004	2·166	2·321	2·466	2·607	2·866	3·111	3·343	3·562	3·774
175	1·772	1·982	2·171	2·348	2·516	2·675	2·826	3·113	3·381	3·636	3·879	4·114
200	1·899	2·124	2·328	2·519	2·699	2·870	3·034	3·346	3·637	3·917	4·182	4·439
225	2·019	2·258	2·476	2·681	2·874	3·057	3·233	3·567	3·882	4·184	4·473	4·753
250	2·135	2·386	2·618	2·835	3·040	3·235	3·423	3·781	4·116	4·443	4·755	5·059
275	2·244	2·509	2·757	2·984	3·201	3·408	3·608	3·987	4·348	4·695	5·026	5·358
300	2·349	2·630	2·885	3·127	3·356	3·574	3·786	4·189	4·571	4·910	5·300	5·651
325	2·450	2·742	3·012	3·266	3·505	3·735	3·959	4·384	4·790	5·182	5·566	5·943
350	2·549	2·852	3·135	3·400	3·650	3·892	4·127	4·575	5·005	5·421	5·829	6·231
375	2·644	2·961	3·255	3·531	3·794	4·046	4·292	4·763	5·217	5·657	6·091	6·519
400	2·736	3·065	3·371	3·659	3·934	4·197	4·454	4·947	5·424	5·890	6·349	6·804
425	2·828	3·168	3·485	3·784	4·071	4·345	4·613	5·130	5·631	6·122	6·609	7·091
450	2·916	3·267	3·595	3·907	4·204	4·490	4·769	5·310	5·835	6·352	6·865	7·379
475	3·003	3·366	3·705	4·027	4·337	4·634	4·925	5·489	6·039	6·582	7·131	7·668
500	3·087	3·462	3·813	4·143	4·465	4·775	5·077	5·664	6·238	6·809	7·395	7·960
550	3·252	3·650	4·022	4·377	4·716	5·052	5·377	6·015	6·641	7·288	7·906	8·556
600	3·412	3·831	4·226	4·603	4·967	5·325	5·672	6·363	7·045	7·735	8·439	9·168
700	3·718	4·180	4·618	5·042	5·453	5·858	6·256	7·052	7·856	8·685	9·551	10·470
800	4·010	4·514	4·996	5·466	5·926	6·381	6·833	7·749	8·691	9·685	10·750	11·910
900	4·288	4·837	5·365	5·882	6·392	6·901	7·412	8·460	9·564	10·760	12·080	13·570
1000	4·559	5·152	5·726	6·291	6·855	7·437	7·998	9·196	10·491	11·930	13·580	15·550

I will now work out an example, to show the reliability of the formula,

$\left(\frac{\text{SPAN}}{4} \div \sqrt{14{\cdot}6 \text{ rise} - \frac{\text{SPAN}^2}{2125}}\right) + \left(\frac{\text{RISE}}{2000}\right)$, = depth or breadth at crown for a load of 1·75 tons per ft. lineal of span, (exclusive of weight of the arch itself.)

We will take a span of 300 feet, with a rise of 50 feet, or $\frac{1}{6}$th of the span.

First to get the depth at centre.

Here $\frac{1}{4}$ the span = 75 feet.

14·6 the rise = 730 feet.

$$\frac{\text{SPAN}^2}{2125} = \frac{90{,}000}{2125} = 42{\cdot}353.$$

$$\frac{\text{RISE}}{2000} = \frac{50}{2000} = {\cdot}025.$$

$$14{\cdot}6 \text{ rise} - \frac{\text{SPAN}^2}{2125} = 730 - 42{\cdot}353 = 687{\cdot}647.$$

The square root of $14{\cdot}6 \text{ rise} - \frac{\text{SPAN}^2}{2125} = \sqrt{687{\cdot}647} = 26{\cdot}2230.$

And,

$$\frac{\frac{1}{4}\text{ span}}{26{\cdot}223} = \frac{75}{26{\cdot}223} = 2{\cdot}8601.$$

And $2{\cdot}8601 + \frac{\text{RISE}}{2000} = 2{\cdot}8601 + {\cdot}025 = 2{\cdot}8851$ feet, the *depth* as well as the thickness, at crown, as per table. Consequently, the area of the single arch at crown, is 2·8851 feet × 2·8851 feet = 8·3238 sq. feet, = 8·3238 × 144 = 1198·63 square inches; and the area at crown of each of the two small arches, into which it must be divided in practice, will be half as great, or 599·32 square inches.

My table was calculated by the foregoing process.

We must now proceed to find the weight of an arch 2·8851 feet square *throughout its length*, and the *horizontal* strain which that weight, in addition to the load of $1\frac{3}{4}$ tons per foot run of span, will produce at the centre, and throughout the entire arch.

Now, the length of an arch of 300 feet span and 50 feet rise, is 321·75 feet and its cross section *throughout* being temporarily assumed at 2·8851 × 2·8851 = 8·3238 square feet, it contains 321·75 × 8·3238 = 2678·183 cubic feet; and at 30 pounds per cubic foot, it weighs 2678·183 × 30 = 80345·49 lbs. = 35·8685 tons.

Now, the load of $1\frac{3}{4}$ tons on every running foot of 300 feet span, amounts to 525 tons; and this added to the temporarily assumed 35·8685 tons weight of the arch = 560·8685 tons, the entire assumed weight of the bridge and its maximum load, including the allowance for momentum, &c.

The *horizontal* strain produced by this entire weight is found by multiplying one-half of it by one-fourth of the span; and dividing the product by the rise. That is

$$\frac{280 \cdot 4342 \text{ tons} \times 75}{50} = 420 \cdot 6514 \text{ tons}$$

temporarily assumed horizontal strain.

Next we must find the strain on each skewback which would result from this assumed 420·6514 tons of horizontal strain, combined with the vertical pressure arising from the assumed half weight of bridge and load, or 280·4342 tons.

As before stated, this strain will amount to the square root of the sum of the squares of these two forces, that is to

$$\sqrt{420 \cdot 6514^2 + 280 \cdot 4342^2} = \sqrt{176947 \cdot 60 + 78643 \cdot 34} = \sqrt{255590 \cdot 94}$$

$= 505 \cdot 5600$ tons temporarily assumed strain on each skewback.

Now, to find the area of the skewback, the thickness of the arch being supposed uniform; it follows that as the pressure at the crown is to the depth at the crown, so is the pressure at the skewback to the depth at the skewback; that is, as

Tons pressure at crown.		Feet depth at crown.		Tons pressure at skewback.		Ft. depth at skewback.
420·6514	:	2·8851	: :	505·5600	:	3·4674

and its area of cross-section will be 3·4674 ft. × 2·8851 ft. = 10·0038 square feet = 1440·55 square inches.

And the area at the skewback of each of the two arches into which it must be divided in practice, will be 5·0019 square feet, or 720·275 square inches.

Having thus obtained the areas at crown, and spring respectively, we are enabled to calculate the *actual* weight of the arch, as well as the *actual* pressures at crown and spring. Let us see what they are; as also whether the actual pressure on the arch is *about* 800 lbs. per square inch; and whether it is uniform throughout the length of the arch.

First, as to the actual weight of the arch.

Its cross-section at the crown is	8·3238	square feet.
And at the skewback, . .	10·0038	"
	2)18·3276	"
Making its mean area, . .	= 9·1638	"

Its contents, therefore, will be 9·1638 square feet × 321·75 feet = 2948·453 cubic feet.

And its weight, 2948·453 cubic feet × 30 pounds = 88453·59 pounds = 39·4833 tons.

Which added to 300 times $1\frac{3}{4}$ tons of load (or 525 tons) = 564·4833 tons of entire weight of bridge and load.

The horizontal strain resulting from this load is

$$\frac{282{\cdot}2417 \text{ tons} \times 75 \text{ ft. } \tfrac{1}{4} \text{ span}}{50 \text{ or rise.}} = 423{\cdot}3625 \text{ tons.}$$

This is the only strain sustained at the crown, where it is divided among 8·3238 square feet = 1198·6272 square inches.

Consequently, the strain per square inch at the crown is $\frac{423{\cdot}3625}{1198{\cdot}6272}$ $= {\cdot}35321$ tons $= 791{\cdot}19$ lbs.; or *about* 800 pounds per square inch.

Finally, the strain on each skewback is composed of the horizontal strain of 423·3625 tons; and the vertical strain of one-half the weight of the bridge and its load, which is 282·2417 tons.

And it is equal to $\sqrt{423{\cdot}3625^2 + 282{\cdot}2417^2} = \sqrt{179235{\cdot}8 + 79660{\cdot}4}$ $= \sqrt{2588996{\cdot}2} = 508{\cdot}8184$ tons.

And this is divided among the 1440·55 square inches of area of the skewback; giving the strain per square inch on each skewback $= \frac{508{\cdot}8184}{1440{\cdot}55} = {\cdot}35321$ tons $= 791{\cdot}19$ lbs. per square inch, the same as at the crown.

Should the calculated weight of a bridge of the foregoing dimensions, including its load, (but omitting the weight of its arches,) be 2, $2\frac{1}{4}$, or any other number of tons per foot run, the dimensions of its arches would still be found by first employing the foregoing process as if the weight were $1\frac{3}{4}$ tons per foot; and the areas of cross-section at crown and spring afterwards increased by multiplying them by 2, $2\frac{1}{4}$, or other number of tons; and dividing by $1\frac{3}{4}$ tons.

The use of my Table is to obviate the necessity for the preceding long calculation. By means of it, for spans of 100 or more feet, the depth and area at the crown, for a load of $1\frac{3}{4}$ tons per foot lineal of span are known by inspection; and those at the spring may be deduced therefrom in a minute or two by the process illustrated at Fig. 5. It then only remains to increase them in the same proportion that $1\frac{3}{4}$ tons bear to the weight per foot run of the bridge and load that may be under consideration.

For spans less than 100 feet, the depths in the Table must be modified by the rule already given for that purpose, before they are employed in practice.

I will add, that if *double the depths given in the Table*, be taken as the *crown* depths of *stone* arches; and if then the depth at springs be found by means of Fig. 5, I believe that a much closer approximation to correct proportions will be secured than is usually done.

AMERICAN PATENTS.

List of American Patents which issued from August 16, to September 13, 1859, (inclusive,) with Exemplifications.

AUGUST 16.

170. Machines for Punching Holes in Leather; G. L. Bailey, Portland, Maine.

Claim—1st, The arrangement and combination of the bed-piece, lever, and hollow cutter, provided with a standard, connecting rod, and treadle. 2d, The arrangement of the circular adjustable cutter bed, in such a relative position to the cutter as to accomplish the object specified.

171. Sewing Machines; Wm. T. Barnes, Buffalo, New York.

Claim—1st, Working the needles vertically and alternately in the same hole in the bed-plate, in the manner set forth. 2d, The arrangement of springs, 5 and 7, wedges, finger, spring, 18, and stop, in the manner specified. 3d, The arrangement of lever, 13, slide, and lever, 12, when said lever, 12, is provided with points, is pivoted to slide, and made to operate in the manner described. 4th, The arrangement of the ratchet wheel, a, serrated bar, and ratchet, e, with the spool-rod and levers, c c′, as set forth.

172. Steam Generators; Mellen Battel, Albany, New York.

Claim—The combination with the tubes extending downward through the tube sheet or crown of the fire-box, or downward into a flue, and upward through the water above the tube sheet of the inner tubes, in the manner described.

173. Clothes Rack; T. D. Berry, Lowell, Massachusetts.

Claim—The construction of my clothes rack with divided centre, or of two sections, each to consist of centre-piece, slats, braces, and circumferential pieces, united to each other as described, when these two sections are combined with each other by plates, so hinged as to allow the rack to be folded and opened, both vertically and circumferentially, to obtain by this divided centre a rack suitable for use, when folded closely and circumferentially.

174. Sewing Machines; E. Booth, Troy, New York.

Claim—1st, The combination of an eye-pointed vibrating lever, and a looper, operating together in the manner set forth. 2d, The vibrating of the eye-pointed lever by a positive motion given to it by the rollers entirely, and as contradistinguished from the use of a spring of any kind, by which means I insure its reliable action under its rapid motions.

175. Horse Rakes; Maro Bradley, Dundee, Illinois.

Claim—The use of the recessed metal bar, spurs. rods or shoes, elastic bar, lever, slide rod, and projection, constructed and employed together, in the manner described.

176. Cabinet Furniture; J. D. Brown, Cincinnati, Ohio.

Claim—The arrangement of the folding ends, and the flaps or leaves hinged on the inside, for the purpose described.

177. Door Fastener; Henry Burt, Newark, New Jersey.

Claim—A permanent door-bolt made with the fastening plates, bolt-case, and bolt, secured and operated as described.

178. Running Gear of Carriages; Joseph Calef, Buffalo, New York."

Claim—The journal box, constructed as described, and combined with the friction rollers or slides. Also, the combination of the axle, journal box, friction rollers, and equivalents, and hub. Also, the arrangement of the jointed braces, in combination with the running gear of carriages, for the purposes set forth.

179. Water-closet; William S. Carr, City of New York.

Claim—Regulating the action of the cock or valve in water-closets by the joint operation of the lever and weight of water in the pan, whereby the cock or valve is kept open until the weight of water in the pan regulates the closing thereof. Also, the construction of the valve, c, with the balancing diaphragm, valve, 10, and spring.

180. Machines for Dressing Stone; H. Chauncy, Perry, Georgia.

Claim—The arrangement of the pick or hammer shafts, adjustable shaft, and adjustable traverse bar, combined in connexion with the reciprocating carriage and laterally moving or adjustable bed, in the manner set forth.

181. Pipe Connexions for Steam Boilers; A. H. Clear, Providence, Rhode Island.

Claim—Making the connexions between the injection pipe, or other similarly submerged pipe of a steam vessel, or any other vessel, with the side or exterior of the vessel, by means of a valve box situated within or between the inside and outside planking of the vessel, fitted with a valve, capable of being operated by a screw, or its equivalent, by a person on or above the deck of the vessel.

182. Manufacture of Machine Belting; J. H. Clifton, New Castle, Pennsylvania.

Claim—The process of manufacturing belting for machinery from fibrous material, as described.

183. Belting for Machinery; J. H. Clifton, New Castle, Pennsylvania.

Claim—Belting made of fibrous material, by the process set forth.

184. Clover Bolts; E. K. Collins, Chili, New York.

Claim—The combination and arrangement of two bolts in clover machines, when said bolts have a counter and upward movement, produced in the manner specified.

185. Mole of Drain Ploughs; T. S. Cox, Lafayette, Indiana.

Claim—The peculiar shape of the mole, c; by the forward movement of the mole, c, the earth is carried from the bottom of the ditch by means of the terraducts, from the point of the mole, d, to the rear of the

shank, and pressed more densely by the increased earth coming in contact with the convex end of the mole. c, in rear of the shank, in such a manner as to make a better arch and more durable than any heretofore made, leaving the bottom of the ditch almost entirely uncompressed; hence, I do not claim anything except the invention of the terraducts, ending in the convex on the top of the mole, c.

186. Carpet-sweeper; John H. Crane, Charlestown, Massachusetts.

Claim—The arrangement of belt, rotating guides, and driver pulley, operating in combination with carpet-sweepers.

187. India Rubber Springs for Railroad Cars, &c.; T. B. DeForest, City of New York.

Claim—Composing a spring of a series of blocks or segments of a circle of vulcanized india rubber, placed and held between two parallel plates, or equivalents; but this I only claim when the series of blocks are so arranged and held between the two parallel plates, that their contiguous faces shall not come in contact, under light loads, but shall come into contact and give mutual support as the load increases.

188. Switches for Railroads; Thomas Dougherty, Macon, Georgia.

Claim—The combination and arrangement of the flat bars and the stationary end plates, provided with the guide rails in connexion with the rails, constructed as set forth.

189. Self-releasing Whiffle-trees; Eugene Duchamp, St. Martinsville, Louisiana.

Claim—Operating the two rods simultaneously by means of the slotted guards, in combination with boxes and lips, in the manner specified.

190. Attaching Thills to Vehicles; Eugene Duchamp, St. Martinsville, Louisiana.

Claim—The combination of the swivel coupling boxes having an elliptical slot through their ends, thill irons having fluked portions and hinged gates, or their equivalents.

191. Carpet-sweeper; Jacob Edson, Boston, Massachusetts.

Claim—Producing the motive power of the machine by means of a belt of rubber or gutta percha, interposed and running between the pulley or roller, and the surface to be swept or passed over. Also, arranging the guiding wheel upon the stationary hollow shaft or bushing, through which the axle of the bush shaft passes.

192. Mole Ploughs; Asahel Elmer, Assignor to Nathan Elmer and Reuben M. Richard, Shabbona Grove, Illinois.

Claim—1st, In combination with the adjustable block on the plough beam, the scoring or leveling plough in advance of it. 2d, In combination with the plough beam and coulter, the swinging-weighted crane or lever, for preventing the careening of the plough, or for recovering its proper position after it has careened. 3d, The combination of a forked coulter, for cutting a wedge-shaped or tapering slice over the coulter gash, with a pressing or driving device for forcing down said slice, and thus packing the coulter gash. 4th, A mole or former made of a series of conical shaped sections, which increase in size or they recede from the coulter, and which are so linked together as that they may move in a horizontal plane, but be comparatively rigid in a vertical plane. 5th, In combination with the mole, the scorer or shoe on its rear section or end, said scorer forming a groove or channel in the bottom of the finished drain, for admitting the water into it, the sides of the drain being so closely packed as to prevent the water from entering there.

193. White Lead Apparatus; D. R. Erdmann, Philadelphia, Pennsylvania.

Claim—A rotary cylinder, arranged with double wire nettings, in combination with a vat, provided with a tube.

194. Fabrics; Alex. Forot, Paris, France.

Claim—The manufacture of a new kind of fabric without weaving, composed simply of threads glued upon a base of paper, or any suitable kind of material, such fabric being left plain or ornamental, by embossing, or any other process.

195. Sawing Machine; Benjamin Fulgham, Richmond, Indiana.

Claim—1st, The combination and arrangement of the two frames, placed one within the other, and arranged so as to admit of the saws being adjusted vertically, and also moved horizontally, forward and back. 2d, The arrangement of the shafts with their respective gearing and the pulley, in connexion with the two reciprocating frames, whereby the saws are rotated, and at the same time have a reciprocating motion communicated to them. 3d, In combination with two circular saws, the inclined ways of the log carriage, for the purpose set forth.

196. Manufacture of Coal Oils; H. P. Gengembre, Alleghany, Pennsylvania.

Claim—The continual progressive and gradual destructive distillation of coal, or other bitumiferous substance, for the purpose of ob aining therefrom the different products of distillation, by means and with the use of the apparatus described, or other equivalent.

197. Manufacture of Porous Rubber Cloth; Charles Goodyear, New Haven, Connecticut.

Claim—As a new porous manufacture, pervious to air and water repellant, composed of a woven or equivalent fabric, and a thin porous coating of india rubber or allied gum.

198. India Rubber Fabrics; Charles Goodyear, New Haven, Connecticut.

Claim—The porous and water repellant manufacture, composed of a bat or fleece of cotton or other fibre and india rubber or allied gum, united and rendered porous.

199. Clasps for Skeleton Skirts; Joseph Grunwald, City of New York.

Claim—The combination of the hoops or springs with the tape, by means of clasps, constructed as described.

200. Cross-cut Sawing Machine; James Hamilton, City of New York.

Claim—The manner of arranging the shaft, d, and its gear wheel, f, and bevel gear, r, in connexion with the bevel gear, s′, and gear, s, on the shaft, l, so that said shaft, d, can be changed to stand horizontally and give motion to the saw, whether the said saw and the gearing therof be in a horizontal or vertical position, thereby adapting one machine to be moved by hand, in felling trees or sawing-up logs. Also, in combination with the aforesaid machine for sawing logs, the detachable frame, buck, and variable lever, for holding smaller logs while being sawed for firewood.

201. Mole Ploughs; A. Hammond, Jacksonville, Illinois.

Claim—The shoe, provided with a knife and projection, arranged in the manner set forth.

[This is an improvement on the shoe or tooth of the mole or drawing plough, and consists in extending

a portion of the tooth out behind the standard, and forming a furrow or groove in the upper surface of it' diminishing, as it reaches the extreme end, for the purpose of closing up the opening left by the standard to prevent the ditch from filling up again. It also consists in forming or affixing, in any suitable way, a pin or angular-shaped knife to the sole of the shoe, to open a place along the bottom of the ditch for allowing the water to pass up into the same and be drained off from below the ditch.]

202. Self-acting Wagon Brakes; B. S Healy, Cohocton, New York.

Claim—The combination of a forked pole with the hounds, whereby the pole is free to slide in its forks and operate the brakes without moving the forks backward in the hounds. Also, in combination with brakes pivoted to a fixed bar, I claim the brake blocks, arranged and connected with the brakes, as set forth, whereby the friction of the wheels on the blocks draws the brakes toward, and causes them to press with greater force against, the wheels.

203. Car Seats; William M. Henderson, Baltimore, Maryland.

Claim—1st, The construction of a railway reclining chair or couch, securely attached to the floor of the car, with the whole chair reversible, so as to face either end of the car. 2d, The mode of varying the height of the back of the chair, by making it in two pieces and suspending the lower portion. 3d, In combination with a chair, reversible as aforesaid, the double-acting foot-board, single reversing leg-rest, and means for extending it by the action of the arms of the chair.

204. Hose Coupling; Robert Heneage, Buffalo, New York.

Claim—The arrangement of the screw sections and packing upon the cone extension, as set forth.

205. Vise; H. C. Hunt, Ottumwa, Iowa.

Claim—Constructing a vise in such a manner that it will self-retain itself upon a table or bench,

206. Cotton Seed Planters; John W. Huntley, Lane's Creek, North Carolina.

Claim—The vertical rotating toothed shaft, in connexion with the follower or gatherer placed within the hopper, and arranged as set forth.

207. Mill-stone Bushes; Levi S. Ives, Brooklyn, New York.

Claim—1st, The placing of a cylinder, D, which contains the spindle collar, blocks, and the adjusting wedges, within a cylinder, M, secured within the centre of the bedstone, the cylinder, D, being allowed a vertical movement or play within the cylinder, M, to permit of the vertical adjustment of the spindle, and consequently the runner or upper millstone, with but little friction, and keeping all the parts in position so as to prevent their derangement. 2d, The arrangement of the plates, J K L, with the washer and ring, or their equivalent, in connexion with the projection on the inner side of the cylinder, D, to prevent the casual turning of the blocks with the spindle. 3d, The plate, N, provided with the flanch and the dome-shaped cap, P, provided with the flanch, in connexion with the cap, T, and plate, the above parts being attached respectively to the cylinder, D, spindle collar, and driver, to form an air and a dust chamber.

208. Mole Ploughs; H. R. Jerome, Monroeville, Ohio.

Claim—1st, The arrangement of a beam, carrying a mole plough, with the front and rear standards of the front and rear propelling wheels, and with the adjusting device. 2d, Providing the coulter with a series of notches, and arranging the draft-chain in one or other of said notches, and thus having the draft applied directly to the coulter. 3d, The combination of a coulter which is elliptical in form in its transverse section, with a mould which is conical at its front and rear ends.

209. Apparatus for Lighting Gas Burners; Wm. B. Johns, of the United States Army.

Claim—Giving the wrench staff the jointed sections, so that a match inserted in the extreme section may illuminate the burner key while the gas is being turned on, and also serve as a torch to ignite the gas.

210. Washing Machine; Thomas J. Jolly, Olean, Indiana.

Claim—The arrangement and combination of the treadle, sliding table, and rotary rubber, constructed in the manner set forth.

211. Machinery for Manufacturing Artificial Fuel; Morris L. Keen, Rogers' Ford, Pennsylvania.

Claim—1st, The combination and arrangement of the mills, conveyors, mixing and heating cylinders, moulding and conveying apparatus, in the manner described. 2d, The combined use of the moulding apparatus, and of the tank or reservoir of water, for the purpose of receiving and moulding the heated and plastic material in said tank of water, for cooling the machinery and fuel, and for preventing the material from adhering to the machine. 3d, The combination of the endless apron with the moulding apparatus, operating in a tank or reservoir of water, in the manner described.

212. Clasps for Fastening Bands on Cotton Bales, &c.; Hazard Knowles, City of New York.

Claim—The method of securing straps by means of a roller, in combination with the wedge-formed mortise of the sleeve, which receives the strap, as described.

213. Churn; S. S. Langdon, Cleveland, Ohio.

Claim—The described construction and arrangement of rotary churns, when the same are provided with the dash frame and chambers, arranged as set forth.

214. Mole Ploughs; Joel Lee, Galesburgh, Illinois.

Claim—The two swords fitting closely together, the front one attached to the mould near the forward point, the rear sword pivoted near the rear point of mould. Also, the lever, in combination with the swords for operating or adjusting the front sword and the mould.

215. Stoves; John Magee, Lawrence, Massachusetts.

Claim—The arrangement of the pot-grate, the hot air chamber, the ring grate, the register, and the ash chamber, together and with direct descending and base flues.

216. Tuyere; Joseph P. Markham, Pennfield, Michigan,

Claim—1st, The use of the indented valve, in combination with the outlet passages, arranged in such manner that, by moving said valve back and forth underneath the outlet, it will admit the wind to, or shut it off from, said outlet, equally and gradually, on each side of the central tube. 2d, The mode of making the loose nozzle independent of the masonry for support, by the use of the tube and its socket, in combination with the ribs and corresponding rebates.

217. Towel Rack; Rufus Maxwell, Tucker Co., Virginia.

Claim—The construction of racks for endless towels, with a slot and opening, as described,

218. Binding Apparatus for Harvesters; Charles H. McAleer, Chambersburgh, Pennsylvania.

Claim—The apparatus or elevator for raising and compressing the gavel, constructed in the manner described.

219. Rotary Movement; W. Howard Mitchell, San Francisco, California.

Claim—Two or more reversed self-detaching pawls or catches, working on opposite sides of the periphery of the ratchet wheel, by being attached to arms working in parallel lines and in the same direction, constructed as specified. Also, the combination of the ratchet wheel with the pawls or catches, and flanches, and the cross-beam, with parallel arms. Also, the combination of the ratchet wheel with the flanched casing or flanches.

220. Rotary Steam Engine; George J. Montjoy and Joel B. Sawyer, Houston, Texas.

Claim—The arrangement of the passages in the double elbow piece and the reversing cock or valve, in combination with the passages in the stationary hollow shaft and its abutment, the whole applied in connexion with the cylinder and its sliding pistons.

221. Seed Planters; Willis G. Murphy, Seguin, Texas.

Claim—The arrangement of the beam, hopper, wheels, seeding wheel, helve, plough, covers, and conductor, as described.

222. Safety-rein for Bridles; Rudolph A. Nathurst and John L. Stewart, Nashville, Tennessee.

Claim—The connexion of the choke-strap with the common or ordinary driving reins, so as to act and serve for both purposes of driving and safety-rein, and this we claim whether it be temporarily or permanently affixed to the bridle or halter, whether a bit is used or not.

223. Skeleton Skirt; Cæsar Newman, City of New York.

Claim—The combination of the jointed or hinged hoop supporters, and a series of horizontal hoops, arranged in the manner described.

224. Steam Slide Valve; J. J. Parker, Marietta, Ohio.

Claim—Placing the valves loosely on the hollow arms of the side pipe, and contracting the supply openings from the valves, for the purpose of employing the pressure of the steam to keep the valves in contact with their seats.

225. Ball Furniture Casters; John C. Pedrick, Washington City, D. C.

Claim—Inserting into a metal cup containing the ball of a caster, a separate anti-friction bearing, against which the ball revolves, thereby lessening the friction of the ball in the metal cup or socket.

226. Trucks for Railroad Cars, &c.; Thomas E. Roberts, Allamance, North Carolina.

Claim—The construction and arrangement of the concave chilled plate and convex chilled plate with each other, in the manner described, and their combination with the self-oiling friction rollers.

227. Shears; James H. Roome, City of New York.

Claim—Combining one limb of a pair of shears, or other similarly operating hand-cutting instrument, with its handle forming part of a separate lever, and combining the said limb and handle with the other limb of the shears by means of an arm attached to the said lever, and operating on the rear portion of the first mentioned limb, a link, connecting the said limb with the said lever, and a movable fulcrum connexion between the said lever and the other limb, to cause the power of the said lever to increase as the shears close.

228. Carriage and Wagon Jacks; William N. Rowe, Sharpsburgh, Maryland.

Claim—The adjustable sliding catch plate, operating in combination with the grease box and jack, as described.

229. Percussion Pellet for Fire Arms; Jacob Rupertus, Philadelphia, Pennsylvania.

Claim—The employment for enclosing the detonating compound of a metal capsule of spherical form.

230. Stoves; John Schleeper, City of New York.

Claim—The arrangement and combination of the fire chamber, ovens, and flues, as described.

231. Portable Iron Husk Grist Mills; Henry W. Shipley and Zohar Blair, Mount Vernon, Ohio.

Claim—The husk and cup, A′, composed of lower and upper sections, the same being turned and fitted together, and supported upon a frame, for the purpose of making the whole portable and complete in itself. Also, cementing the stone to the interior of the cup, A, which also forms the upper husk. Also, the cup, M, constructed as described, and cementing the stone thereto, so that both will revolve together. Also, the bridge trees, in combination with the husk, cup, A′, and frame, arranged as set forth.

232. Butter Worker; Henry Soggs, Columbus, Pennsylvania.

Claim—The tray, with convex bottom and ends set on an inclined plane of rollers, working in combination with the cylinder and ribs, for the purpose of working the milk and superfluous matter from the butter, at the same time leaving channels in said butter through which the milk, &c., may escape.

233. Slide Valves of Steam Engines; David Stoddard, San Francisco, California.

Claim—1st, The employment of the elastic plate, in combination with a cavity and a balance frame, as described. 2d, The combination of an adjusting spring and screw, with the elastic plate, as described.

[A flexible metallic plate is applied, in combination with a balance frame, between the back of a slide valve and the back of the steam chest, whereby the valve is relieved of unnecessary pressure, and caused to work with very little friction. This is the invention. The valve and the balance frame are constructed of a certain form, and a spring and set-screw are so applied, in combination with the flexible plate and balance frame, as to compensate for the wear of the frame, the valve, and seat.]

234. Steam Generator; William Mount Storm, City of New York.

Claim—1st, The plan or method of conveying water from a closed tank or reservoir to the heating surfaces of a steam generator by capillary attraction. 2d, So constructing and locating the said supply tank that the influence of the heat upon the water contained therein for feed, while elevating its temperature, shall in no case bring it up to the steam generating or boiling point under the given pressure.

235. Weighing Scales; Francis M. Strong and Thomas Ross, Brandon, Vermont.

Claim—The arrangement of the bars of the larger platform, to wit: one lever crossing the other at about right angles, so that the knife-edged bearings of the foot-pieces of one lever will be at right angles to those of

the other, and the lateral movement of the foot-pieces on the bearings prevented. Further, attaching the arms of the levers either separately or when connected direct to the beam, and having the bar of the scoop or smaller platform rest on knife-edged bearings on the beam.

236. BLANK FOR SHOE-PEGGING MACHINES; B. F. Sturtevant, Boston, Massachusetts.

Claim—A blank or strip of shoe pegs cut around the log, as described.

237. MACHINE FOR NICKING AND TRIMMING HEADS OF SCREWS; N. G. Thom, Cincinnati, Ohio.

Claim—1st, A revolving or rotating head, which revolves around a series of spindles or blank holders with an intermittent or interrupted motion, carrying upon it the necessary apparatus and tools for shaving, nicking, and trimming, or otherwise finishing the heads of screw blanks. 2d, In combination with the spindles or blank holders, the annular cam, having internal and external inclined surfaces, for the purpose of raising the spindle in the nicking process, and operating the grippers by acting upon the one rod. 3d, In combination with the spindles or blank holders, the rod, d, and spring, or its equivalent, when such a spring, or equivalent, is made to act upon the rod at required intervals, to discharge the blank, by being attached to some rotating or reciprocating portion of the machine. 4th, The lever, the spring, and catch, or other mechanical equivalent, which acts upon the machine, for the purpose of arresting one part while it releases another. 5th, The arrangement of the spindles and driving shaft in such a manner that, while the spindles containing the blanks to be shaved and trimmed are acted upon by the driving belt, the spindle containing the blank to be nicked is not acted upon, and the necessary tension is given the belt at all times in the revolution of the head without the use of a binder. 6th, In combination with the worm wheel, or its equivalent, for giving motion to the cams, I claim the cam, Y, and tool cam, X, when acted upon in such manner that the said cams remain stationary while the head revolves, or nearly so, and the cams revolve while the head is stationary. 7th, Finishing the heads of screw blanks by an apparatus, by which the necessary tools for finishing the head are revolved round the spindles or blank holders, whether such blank holders are stationary or otherwise.

238. LAYING SUBMARINE TELEGRAPH CABLES; Andrew Turney, Jr., Fairfield, Connecticut.

Claim—The construction and use of an apparatus consisting of two hollow cylinders with longitudinal joints or hinges, and two discs or flanches, set obliquely to the cylinders, and a guide or regulating disc, to be attached to a telegraph cable, while the cable is being submerged, to check the rapidity of the sinking, and to afford a constant strain on it in the direction of the vessel which is paying out the cable, to avoid kinks or festoons.

239. WASHING MACHINES; John Wagoner and Abram Severson, Guilderland Centre, New York.

Claim—Mounting the revolving platform, K, and the pulley and gearing, or their equivalents, on the hinged platform, M, and so arranging the whole that, when M is turned up, the driving belt, O′, is slackened, and the whole lies within or by the side of the main frame—and when M is turned down, the gravity of the tub, or equivalent vessel, tightens O, and causes the several parts to operate without any labor in adjusting.

240. CARDING ENGINES; Samuel Wethered, Baltimore, Maryland.

Claim—1st, A card-clothed main cylinder for carding engines, which performs a lateral vibrating movement simultaneously with its revolution. 2d, A card-clothed "fancy" or upper cylinder, which is capable of performing a lateral vibration as it revolves, in combination with a laterally vibrating card-clothed main cylinder.

241. HAT MEASURES; Julius Wehlé, City of New York.

Claim—1st, The divided handle, in combination with the elastic oval strip, for the purpose of contracting the said oval strip. 2d, The scale, secured to one of the handles, and passing through an incision of the other handle, in combination with the screw.

242. HORSE POWER MACHINE; Y. B. Williams, Freeport, Illinois.

Claim—The arrangement and combination of the circular standard, toothed rim, ring, C, pinions, D, wheels, E, pinion, e, toothed ring, G, and pinion, H.

243. MACHINE FOR BUNDLING KINDLING WOOD; Wm. S. Williams, City of New York.

Claim—1st, The feeding clamps and slides, arranged and actuated in the manner set forth. 2d, The combination of the separating and dividing knife, with the concave wood carrier to convey the wood to the bundling apparatus. 3d, The sliding support, arranged to sustain the kindling wood as fed into the machine, and keep it in place. 4th, The curved gatherers, fitted and acting to deliver the bundle of wood and gather the next loose wood into a bundle. 5th, The conical gatherers, to concentrate and compress the bundle of wood. 6th, The stationary plate and segments, in combination with the conical gatherer to sustain the wood while acted upon. 7th, The plunger or press-block, acting to bring the ends of the bundle of wood level. 8th, The vertical moving frame forming the reception for the wire, and the guide for the apparatus that wraps said wire around the bundle of wood. 9th, In combination with the frame, I claim the chain to wrap the wire around the bundle of wood, and the clamp to hold the wire near the middle part thereof. 10th, The circular twisting jaws moving in dovetails, and acting, when revolved by competent means, to twist the ends of the wires together. 11th, The arrangement of the sliding and revolving shaft, in combination with the twisting jaws. 12th, The spring guides, to keep the wire straight while passed into the machine, in combination with the traveling jaw or clamp and with the shear.

244. PATTERNS FOR MOULDING; John Alexander, Assignor to self and James Ritchie, Brooklyn, New York.

Claim—The employment or use of a "former," with a pattern constructed of a plastic substance, and formed on or over the "former," to produce moulds in sand for the casting of hollow ware and other castings of the exact thickness required.

245. HANGING THE BODIES OF WHEEL VEHICLES; Charles Bradfield, Assignor to C. Stewart Bradfield, Philadelphia, Pennsylvania.

Claim—1st, Attaching the wheels to the body, by means of the arms secured to the traverse bars of the shafts or arbors, which are fitted on the flanches and bearings of the plates of the body, and having springs placed between their flanches and traverse bars. 2d, Attaching the thills to the body by means of the bars, fitted in the eyes, and secured thereon at the desired height by set-screws.

246. APPARATUS FOR SUPPLYING FURNACES WITH HOT AIR; Calvin Fletcher, Assignor to Addison C. Fletcher, Cincinnati, Ohio.

Claim—The arrangement of the fan and the steam chambers, A, communicating with the chambers, B C, together with the inlet steam pipes, E, the cold air passages, hot air pipes, G I I, and the pipes, F, for the discharge of the water of condensation.

247. Restoring Waste Vulcanized Rubber; Hiram L. Hall, Assignor to the Beverly Rubber Company, Beverly, Massachusetts.

Claim—The restoring of waste vulcanized rubber or gutta percha by the use of superheated steam, in the manner described.

248. Cotton Presses; Miles B. Hand, Assignor to self and Sheldon B. Hand, Handsboro', Massachusetts.

Claim—The combination of the toggles and screws, when the latter are connected to the driving or power shaft, or to a shaft connected therewith, by means of universal joints.

249. Churn; John J. Lehaye, Reading, Assignor to self and John Tucker, Philadelphia, Pennsylvania.

Claim—The vessel, cylinder, and reciprocating plunger, adapted to and arranged in respect to each other, as set forth, in combination with the devices described, or their equivalents, for enlarging or contracting at pleasure the communication between the said cylinder and vessel.

250. Machine for Making Hooped Skirts; Cæsar Neumann, City of New York, Assignor to Abraham Prince, Boston, Massachusetts.

Claim—The combination of a series of twisting apparatus with guide rods, for the purpose of forming a hoop skirt. Also, in combination with the twisting apparatus, the elevating screw and its appendages, and the mode of operating the same. Also, collapsing the guides to form different sized skirts, and to deliver the same.

251. "Fifth Wheel" for Fire Engines and other Vehicles; Robert Poole, Assignor to self and G. H. Hunt, Baltimore, Maryland.

Claim—Hanging the pivoted fifth wheel of a steam fire engine, or other heavy carriage, to a bolster when the latter plays within or over the axle of a vehicle, and is suspended to springs which have their bearings or seats on said axle.

252. Meat Safe; E. L. Pratt, Assignor to self and R. B. Fitts, Philadelphia, Pennsylvania.

Claim—A combined arrangement of a cover, perforated with small holes at the upper part, and a stand, also perforated with small holes, as specified.

253. Iron Fences; John B. Wickersham and Henry Jenkins, Brooklyn, New York, Assignor to the New York Wire Railing Company.

Claim—Constructing railways, fences, and other articles, by metallic bars intersecting each other, and united by a cast iron ornament or connexion, when one or more bars running parallel, or in one direction, pass through between two or more bars running in another direction.

254. Mode of Lighting Gas by Electricity; Archilaus Wilson, City of New York, Assignor to D. A. Heald, A. L. Wilmarth, C. T. Martin, and H. A. Hurlbut.

Claim—Combining, with a gas or other burner, metallic points approaching but not coming in contact with each other—but this I only claim in combination with the inductive apparatus, for the purpose of effecting ignition by means of the electric discharge or spark. Also, combining with a galvanic battery, an inductive apparatus or coil, metallic points, and an electro-magnet, for the purposes specified.

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255. Machinery for Forming Hat Bodies; Peter Arneson, Newark, New Jersey.

Claim—The arrangement and combination of the adjustable plates, perforated apron, case, feed rollers and pickers.

[The invention consists in disposing, by means of a suction blast and adjustable register, the fur on an endless perforated apron or other carrier, in such a manner that the fur will be presented to the picker and through the latter presented to the cone in a volume varying in density, and corresponding to the varying thickness of the hat body to be formed. It also consists in arranging the former or perforated cone relatively with a picker and discharging rollers, so that the former or cone will receive the fur in proper quantities without the aid of deflectors, guides, or any extraneous device whatever.]

256. Shipper-gear for Pulleys; Albert Betteley, Boston, Massachusetts.

Claim—The combination of a brake lever, a friction roller, and an independent brake, applied and operating together, and with a shipping apparatus.

257. Bed-bottom; R. F. Billings, Portland, Maine.

Claim—The arrangement and combination of the side rails and boxes, provided with the springs, and hinged lids, and slats, attached to the lids by the straps.

258. Bed-bottom; A. Bingham, Talladega, Florida.

Claim—The arrangement and combination of the longitudinal slots, rocking foot rail, rising and falling hand rail, and segment guides.

259. Finger Rings; Seba Bogart, City of New York.

Claim—An extension or divided finger ring having its ends provided with a catch or fastening.

260. Grinding Mills; Charles W. Brown, Boston, Massachusetts.

Claim—1st, Regulating the adjustable stone of a grinding mill that the stone may have a vertical adjustment, so as to grind finer or coarser at the same time, so that the pressure of the runner, with respect to the stationary stone, will be automatically equalized, and be raised and lowered to free itself of any foreign substance getting between the two stones, by means of levers and vertical rod, toggles, sliding collar, and weighted arms, acting upon the movable bearing plate, or the equivalents thereof. 2d, The method set forth for regulating the flow of the grain from the hopper, by adjusting the same vertically. 3d, The dead-eye, arranged within the eye of the upper stone and capable of being raised or depressed with the spindle.

261. Cut-off Gear for Steam Engines; C. P. Buckingham, Mount Vernon, Ohio.

Claim—The employment of the tripper, arranged so as to be adjusted and to trip both valves, in combination with drops, arms, and lifters.

262. Inkstand; William Burnet, City of New York.

Claim—The construction of an adjustable apparatus, connected with the cover and flexible bottom of an inkstand, so that at whatever height (above the lower orifice of the funnel) the link on the main reservoir may be, there shall always be a sufficiency, and never an overflow, in the funnel, on opening the inkstand cover.

263. GRINDING MILLS; J. Carl, Grenada, Mississippi.

Claim—1st, The arrangement and combination of the pivoted lever, shaft, stone, C, and screws. 2d, The employment of a hinged top-bar, in combination with the shaft, and stones, C D.

264. WASHING MACHINE; H. M. Coombs and L. W. Nelson, Portland, Oregon.

Claim—The construction of the clothes' cylinder surrounded with air tubes, having orifices for discharging air into the water, in combination with the drying and washing cylinder and fire chamber.

265. MOLE PLOUGHS; C. W. and J. H. Crandall, and Hoza N. Hawkins, Cameron, Illinois.

Claim—The combination of the opening or ditching piece with the standard and peculiarly formed, hinged follower or former, operating in the manner set forth.

266. RAT-TRAP; E. H. Crane, Burr Oak, Michigan.

Claim—The arrangement of the platform, spring, c, strap, spring, i, and chuck, with arms provided with projections, spring, H, and box, provided with hanging door.

267. MANUFACTURE OF RIBBED ELASTIC CLOTH; H. H. Day, City of New York.

Claim—The method of manufacturing ribbed elastic cloth, that is to say, elastic cloth containing strands of rubber, by forming the strands of rubber upon the covering cloth, with which they are to be permanently attached, in contradistinction to forming the strands separately, and afterwards attaching the covering material to them. Also, the method of spreading the gum upon the covering cloth, and dividing it into strands at one process, so that the two operations are effected simultaneously at different parts of the same apparatus.

268. MACHINES FOR WINDING THREAD; Lucius Dimock, Hebron, Connecticut.

Claim—The arrangement and combination with the guide of two separate and distinct series of grooves, having their channels cut on opposite angles.

269. COMPOSITION FOR CEMENT ROOFING; Joseph Ditto and Henry Van Bergen, City of New York.

Claim—The composition prepared and composed of the materials described, in the proportions set forth.

270. NAIL MACHINES; Daniel Dodge, Keeseville, New York.

Claim—A griper, having a reciprocating movement towards and from forging or pointing machinery, and opening automatically at the outer extremity of its stroke, so as to allow the introduction of feeding forward, or removal of the rod, while it is in this position, but holding the rod fast at every other stage of its operation, and while in any other position. And in combination with a so operating griper, I claim the employment of a gauge and a cutter or cutters, operating in the described order of succession with respect to each other and the griper.

271. WRITING FLUIDS; S. W. Eells, Mansfield, Ohio.

Claim—The manner of combining the above materials, so as to prevent the oxidation of the indigo, and the other coloring ingredients, as specified.

272. KNITTING MACHINES; E. S. Ells, Troy, New York, Assignor to C. G. Keeney, Manchester, Connecticut.

Claim—The combination and arrangement of the lever, e, arm, pin, and slot, with lever, l, detent, and springs.

273. ELASTIC BULB SYRINGES; J. J. Essex, Newport, Rhode Island.

Claim—So combining and arranging the bulb, air chamber, and delivery valve with each other, and with the flexible suction and delivery tubes, that the air chamber shall be above the delivery valve, and shall remain while in use, upright, or nearly so, and under the control of the hand which grasps and operates the bulb.

274. BELT FASTENING; Albert Fickett, Rochester, New York.

Claim—The combination of the links with the rivets, said links being inserted in the ends of the belt, in the manner set forth.

275. EASY CHAIR; Elbridge Foster, Hartford, Connecticut.

Claim—The application and insertion of the quadrant slide into the centre of each of the arms or scroll of the side rail, so as to be unseen when the back is up, in the manner described. Also, the application of the spring, adjustable and extension back centre leg, in the manner described.

276. METHOD OF FEEDING THE SAW TO THE STUFF IN SAWING MACHINES; James F. Gamble, Concord, Penna.

Claim—Moving the saw forward when cutting, whilst the lumber is held stationary.

277. HUB-REAMER; Stacy A. Garrison, Union, New York.

Claim—The arrangement and combination of the cutters and the arbor, as described.

278. MACHINE FOR MAKING PAPER BAGS; William Goodale, Clinton, Massachusetts.

Claim—1st, The pasting apparatus, consisting of the roller fitted to work in an opening in the bottom of a paste-box, the spring, or its equivalent, and the adjustable stopper, combined to operate as described. 2d, The combination of the continuously revolving measuring rollers, and the intermittently revolving feed rollers. 3d, The drop, N, operating in combination with the cutter and the feed rollers, as specified. 4th, Folding the paper around a plate or flat piece of any material narrower than the bag itself, or of the same width as, but shorter than, the bag itself. 5th, The folders, applied and operating in combination with the inclined planes at the sides of the folding table. 6th, The combination with the folding table and with a plate narrower than the bag, to fold the bag upon, of one or more movable inclined planes, and creasing blades, operating as described. 7th, The drop, Z, applied and operating as described. 8th, The bar, applied to the vibrating roller frame, and operating in combination with the knock-off.

279. POROUS-NAPPED RUBBER FABRICS; Charles Goodyear, New Haven, Connecticut.

Claim—A new porous manufacture or fabric, composed of a woven or other cloth, or equivalent therefor, and india rubber or allied gum, rendered pervious to air and impervious to water, and with a face of flocks, clippings, or shearings, of woolen or other fibres, or equivalents therefor.

280. COOKING STOVES; Rensselaer D. Granger, Philadelphia, Pennsylvania.

Claim—Placing across the upper flue of a cooking stove a hollow box-formed partition, communicating with the external air, the said partition having two openings, arranged in respect to the boiler holes in the top plate, as set forth, and the said openings having their inner surfaces perforated.

281. HARVESTERS; John S. and Rezin Hawkins, Greenfield, Indiana.

Claim—The arrangement of the main frame and team shaft, in combination with the adjustable frame and hinged shoe or cutting apparatus, constructed in the manner described.

282. Screw Presses; Thomas R. Hopkins, Assignor to self and R. E. Robinson, Petersburg, Virginia.

Claim—The use, in combination with a power-screw of a press, or other machine, of two revolving nuts, which are fitted to gear into the thread of said screw, and so arranged and operated upon, in order to give motion to the screw, that the upper one remains stationary while the lower one revolves, and vice-versa.

[This invention consists in giving the follower of a press a progressive upward or downward motion, by means of two sets of cams, with friction rollers between them. The cams are arranged on discs, which have spur-teeth on their circumferences; the upper disc has one more tooth than the lower one. Into these teeth a long pinion gears, said pinion being moved slowly by a long lever, and as it turns, the upper disc gradually gains on the lower one, and, consequently, with the aid of the friction rollers, rises and forces up the follower with a powerful pressure, the gradual elevation being retained at all times by reason of the cams of the lower disc which has no vertical movement, acting antagonistic to the cams of the upper disc which both revolves and moves vertically up and down.]

283. Cooking Apparatus; Robert W. Hill, Naugatuck, Connecticut.

Claim—The portable cooking or heating apparatus composed of the hot air chamber and fire-pit, when provided with ports furnished with registers, with the partition and draft apertures.

284. Marine Propeller; Hermann Hirsch, Berlin, Prussia.

Claim—The peculiar form and construction of a propeller, whereby the centrifugal force obtained is made to co-operate with and increase the effect of the same.

285. Construction of Ships; Hermann Hirsch, Berlin, Prussia.

Claim—The form and construction of the hull of ships or vessels, whereby the possibility of breakage of keel is removed, and a normal form, giving a maximum of steadiness, without retardation of velocity, is imparted to the bottom.

286. Feeding Paper to Printing Presses; Richard M. Hoe, City of New York.

Claim—The combination of the feeding mechanism, cutting apparatus, and the printing machine, or their equivalents, in the said combination for feeding the paper from a roll to a printing machine, and cutting or partially cutting it into sheets, as it passes along to be printed. Also, making the cutter so as to leave the several sheets united in certain places, in combination with the conducting tapes, or the equivalents thereof, so that the conducting tapes may pass around the cutter-cylinder. Also, in combination with the cutter-cylinder and the grooved cylinders, or the equivalents thereof, the employment of the two pressure rollers, or their equivalents, for keeping the sheet distended.

287. Machines for Weighing Grain; Charles H. Hunter, Shelbyville, Indiana.

Claim—The combination of the scale beam or lever with the bag-holder secured to one end, and the standard with rack and pinion for elevating or depressing the scale beam.

288. Harvesters; Obed Hussey, Baltimore, Maryland.

Claim—1st, The combination of the main ground wheel seat and platform, when hinged to the main frame. 2d, The raising and the lowering of the entire frame, finger bar, and outside divider upon the two ground supports, in a horizontal position, by means of a lever and its connexions therewith, operated by the driver from his seat.

289. Mechanism for Protecting the Upper Part of a Boot or Shoe while Applying the Sole; Jacob Jenkins, Lynn, Massachusetts.

Claim—The arrangement of a shoe-jack (or mechanism for supporting the toe and heel parts of a boot or shoe), a guard or protector, the same being made to encompass the upper part of a boot or shoe, or so much of it as extends above the bottom surface of the last, and a clamping contrivance for adjusting the protector to the countour of the shoe. Also, the application and arrangement of an adjustable guard to the protector, whereby the fitting of the outer sole to the insole and upper is not only greatly facilitated, but is rendered certain of being fixed in its true and proper position.

290. Scales; Walter W. Kelley, Reedtown, Ohio.

Claim—The adjustable rack and platform, arranged in combination with the centre-piece upon which the rack and platform are placed, so that either one can be used at pleasure.

291. Pegging Machine; W. R. Landfear, Hartford, Connecticut.

Claim—1st, The employment, in combination with the bar, of the vertically and laterally moving box, having a plate, awl, punch, and inclined face, arranged so that on the descent of the plate the awl will enter the sole, and the inclined face will, while the awl remains in the leather, shove the bar along laterally, thus insuring certainty and regularity of feed; and on the elevation of the plate, the box will be moved laterally by the spring, the awl will be carried over the point where a new hole is to be made, and the punch brought over the previously made peg-hole in readiness to drive home the peg on the next descent of the plate. 2d, The combination with the vertically and horizontally moving box of the spring, for giving a lateral movement to said box, and the adjusting screw for regulating the spaces between the peg-holes. 3d, The arrangement and combination with the bar of the adjustable elastic plate, against which the peg block is pressed, said plate being adjusted by means of the screw to suit any size of pegs.

292. Sleeping Berths for Railroad Cars; D. L. Long, Dayton, Ohio.

Claim—The arrangement and combination of the jointed supporters and hinged seat and back, with the folding berth, screen, and rest, arranged so as to form two sleeping berths, as described.

293. Alloys; Eugene Martin, Waterbury, Connecticut.

Claim—The process or mode of procedure, as applied to the ingredients, such as described.

294. Pumps; John M. May, Janesville, Wisconsin.

Claim—The cylinder, in combination with part, A, arranged and operated with piston and pipe, as described. Also, the screw, D, when used for the purposes of fastening and unfastening the stationary part of the pump in the well or reservoir to any suitable substance, as described. Also, set-screw, N, in combination with the notch or projection, or their equivalents, to form a catch or wrench, for turning the screw, D, and pump nearly in the path of a horizontal circle, in fastening and unfastening the stationary part of the pump in the well or reservoir, the set-screw also serving to gauge the descent of the piston and to protect the valves from injury. Also, the devices consisting of the springs, segment, and lever, connected together, as described.

295. Pumps; John M. May, Janesville, Wisconsin.

Claim—The device for connecting together the cylinders, and regulating the stroke of the pump, in com-

bination with the point or spike, or its equivalent, when used in open wells, and said device in combination rod, when used in drilled wells. Also, the collar and springs, when used in combination with the pump or with the eduction pipe, and arranged as shown.

296. ARGAND GAS BURNERS; Hippolyte Monier, Paris, France.

Claim—The construction of the Argand burner, with its grate and external tube of clay, porcelain, or other incorrodible, refractory, non-conducting material, and with the inner tube and stem of metal.

297. CORRUGATED IRON BRIDGES; Richard Montgomery, City of New York.

Claim—1st, The combination of the corrugated arch, A B, with the corrugated arch, M N, arranged in relation to each other. 2d, The combination of the peculiarly formed blocks, C, and bed-plates, F, with the abutment ends of the arches, A B and M N. 3d, The combination of the blocks, D, and bottom plates, G, with the cross-rails and arches, A B and M N.

298. LADIES' BUSTLES; Benjamin F. Moore, City of New York.

Claim—An inflated bustle for ladies' dresses, formed with the projecting points or scollops, in the manner specified.

299. MODE OF MEASURING GRAIN; Daniel Murray, Fairfield, Connecticut.

Claim—The arrangement of the arms, in combination with the sides, constructed as described.

300. STAMPING MACHINES FOR CRUSHING ORES, &c.; Wm. Murray, Baltimore, Maryland.

Claim—1st, The combination of two or more stampers arranged on the same radial line with two or more semicircular, inclined, revolving, lifting, and dropping cams, which move together, and with a central driving shaft. 2d, Providing the semicircular lifting and dropping cams with a vertical joint about midway between their terminating ends, and with an oblong vertical slot at their rear or highest ends, and attaching said ends, by means of a set-screw, or its equivalent, to the frame of the cams, so that the inclination of said cams may be adjusted to lift the stampers to a greater or less height, according to the force required to perform the operation of stamping.

301. RECIPROCATING SAW; Richard H. Osgood, Columbus, Ohio.

Claim—Providing the upper edges of saw teeth with notches, as described, for the purpose of assisting to clear the kerf of sawdust.

302. HOISTING APPARATUS; John L. Pott, Pottsville, Pennsylvania.

Claim—The inclined drum, revolving in a plane parallel, or nearly parallel, to the lines of hoisting rope, in combination with the guide pulleys on the cross-head, the latter being operated by the shaft or the drum through the medium of the screw, or its equivalent, as set forth.

303. TAPPING WATER MAINS; John B. Quigley, Trenton, New Jersey.

Claim—The employment of the pivoted standards, jaws, adjustable beam, adjustable swivel, chain, vertical sliding piece, and ferule, as described.

304. INKSTAND; Thomas Robjohn, City of New York.

Claim—The arrangement and combination of the ring, D, cover, arm, slatted projection, and diaphragm, so that by pressing down ring D, the cover will open and the ink rise; and by releasing the ring, the ink will fall and the cover will close.

305. METHOD OF SHAPING BONNETS; Charles W. Russell, Philadelphia, Pennsylvania.

Claim—The method of shaping bonnets, &c., by means of a core, or its equivalent, which is wound over the several parts of the bonnet, and which is retained in position by hooks, or their equivalents.

306. MACHINE FOR PRESSING BONNETS; Charles W. Russell, Philadelphia, Pennsylvania.

Claim—The arrangement of the adjustable roller, or its equivalent, in such relation to the chain or rope, which connects the treadle with the press lever, that the direction in which the pressing iron acts can be controlled.

307. ROTARY ENGINES; Augustin P. Samuel, City of New York.

Claim—The method of governing and working the pistons by connecting their piston rods through the roller holders and rollers, directly with the eccentrated curve. Also, the combination and arrangement of the valves with and within the movable pistons, whereby such valves are opened by the first motion of the piston rods, and before any motion is given the pistons, so that a passage is given to the steam within such pistons, and the steam admitted on both sides thereof, for the purpose of producing an equilibrium of pressure on each side of such pistons before they are put in motion. Also, the construction and arrangement of the packing rings acting against each other by inclined surfaces; the outer ring being conical or tapering, on both sides, and the inner ring, being tapering on one side only towards the ring, and the inner ring acting against the other by means of the spring, or its equivalent, expanding it outward against the cylinder, and inward against the piston.

308. MORTISING MACHINE; Hezekiah B. Smith, Lowell, Massachusetts.

Claim—The relative arrangement of the fulcrum, lever, connecting rod, and table, with each other, when combined with power mortising machines.

309. STOVES; George S. G. Spence, Boston, Massachusetts.

Claim—The use of the conical inverted cup, combined with the chain, or its equivalent, in the manner set forth. Also, the combination of the air deflector with the fire-place door register, and so as to operate therewith, and deflect the entering currents of air upon or toward the ignited surface of the fuel.

310. SEWING MACHINES; Orange N. Stoddard, Oxford, Ohio.

Claim—The yielding metallic loop-check, operating in combination with a grooved hook, or its described equivalent, in the manner set forth.

311. ANIMAL TRAP; Zuriel Swope, Lancaster, Pennsylvania.

Claim—1st, The sinking bottom, constructed for closing the trap, when acting in combination with the spring and bait lever. 2d, The counterbalance chamber, constructed as described, and operating for the purpose of re-setting the trap.

312. GAS RETORTS; H. K. Symmes, Newton, Massachusetts.

Claim—The arrangement of the removable flues and valves, in combination with retorts of double length.

[This invention consists in arranging the lid of a retort with a horizontal tube or flue in such a manner

that the flue can easily be removed and cleaned independent from the retort, and it further consists in arranging it with a socket to fit to a flanch which is cast, or otherwise rigidly attached to the lower end of the stand pipe, so that the lid can be attached to the body of a retort, dispensing with the mouth-piece altogether; and that the gas emanating from the material in the front part of the retort has to pass back over the hotter portion of the coke in order to reach the opening in the flue through which it passes to the stand pipe, and the stand pipe is secured to the body of the retort, so that its lower end is open when the door is taken off. If this arrangement be applied to retorts of double length, the openings of the flues are closed by valves which are operated from the outside, and the two ends of the retorts are closed at different times, so that one end is hot while the other is charged, and by closing the flue on this end, the gas arising from the fresh charge can be forced to pass through the whole length of the retort to the flue on the opposite end.]

313. Ticket-holder for Railroads, &c.; Charles Taylor, Little Falls, New York.

Claim—The eye, spring clasp, and spring hook, in combination with the link, or its equivalent.

314. Preparation of Candlewicks; Stephen R. Weeden, Providence, Rhode Island.

Claim—A plaited or braided candlewick, saturated with a solution of acetate of lead, or other substance, to aid combustion, and coated with a silicate, as and for the purpose set forth.

315. Railroad Chairs; J. W. Wetmore, Erie, Pennsylvania.

Claim—The T lip or jaw, notching the web of the rail, and through these notches, having the bottom of the jaw pass down, and riveted or keyed under the base.

316. Water-wheels; Ira Wisel, Newbury, Minnessota.

Claim—The peculiar form of the buckets, in combination with the rest of the wheel.

317. Knitting Machines; F. L. Buel, Assignor to C. G. Keeney, Manchester, Connecticut.

Claim—Attaching the mechanical device, above set forth, to a knitting machine, namely, by the thread guide, lever, c e, and arm. Also, the arrangement of the lever, k, connexions, frame, and arm, as described.

318. Sewing Machines; Jonas Hinkley, Assignor to self and Frederick A. Wildman, Clarksfield, Ohio.

Claim—1st, The combination of the looper and receiving spring hook, arranged in the manner set forth. 2d, The combination of the deflecting hook, the looper, and the receiving hook. 3d, The lifting finger, or its equivalent, operating as set forth. 4th, The combination of the lifting finger with the looper and receiving hook, as described. 5th, The combination of the lifting finger, the deflecting hook, the looper, and the receiving hook, as described. 6th, The combination of the arm, link, and lifting bar, with the vibrating bar and feeding hand, for the purpose described.

319. Cam Presses; Thomas R. Hopkins, Assignor to self and R. E. Robinson, Petersburgh, Virginia.

Claim—Operating a press follower, or other part of a machine which is required to give a gradual pressure, by means of the combined agency of two differentially toothed discs, which revolve at unequal speeds, two sets of reverse acting cams and intermediate friction rollers, or their equivalents.

320. Machinery for Making Clay Pipe; Wm. Linton, Assignor to self and John Jones, Baltimore, Md.

Claim—The two-sized permanent core or mandrel, in combination with the fixed die and adjustable jaws, arranged in the manner described.

321. Quartz Mills; E. T. Steen, San Francisco, Assignor to self and B. S. Nichols, Sacramento, California.

Claim—The employment of stampers, operated by means of steam cylinders, which communicate by the cross-passage, the change of steam being effected by valve pistons operating on a working beam, and operated by the pistons.

322. Manufacture of Iron; Bernard Louth, Assignor to Jones & Louth, Pittsburgh, Pennsylvania.

Claim—Rolling iron or steel in a cold state for hardening and adding strength to it, without injury to its fibre, and at the same time reducing it in size.

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323. Lozenge Machines; Edmund Belling, City of New York.

Claim—The combination of a revolving or reciprocating knife with the lower part of a press, and operated simultaneously with the same, in the manner described.

324. Horizontal Water-wheel; Abraham Andrews and Harrison Kalbach, Bernville, Pennsylvania.

Claim—The curved concave buckets, having curved or eccentrically formed tops and bottoms, in combination with a spiral water-way or chamber underneath, and arranged within a box, as described.

325. Artificial Legs; Douglas Bly, Rochester, New York.

Claim—1st, The combination of the segment of rubber, or its equivalent, with the foot and leg, in the manner described. 2d, Connecting the foot to the leg, by means of the cord, or its equivalent, thereby dispensing with all joints, bolts, hinges, and metal straps, and the friction and noise to which they give rise.

326. Elastic Hose Tubing; J. C. Boyd, Boston, Massachusetts.

Claim—The hose made of flexible tubes, the same consisting of a woven fabric of cotton, hemp, or other fibrous materials, lined with or fastened to a layer or sheet of india rubber or gutta percha, or any other water-proof composition, and the whole secured by rivets.

327. Iron Ties for Cotton Bales; William Boyd, New Orleans, Louisiana.

Claim—In combination with the splits, the use of a key, having wings at each end, to form the lock to the tie, arranged as set forth.

328. Tanning; Jehu Brainerd and W. H. Burridge, Cleveland, Ohio.

Claim—The improvement in tanning set forth, consisting in the immersion of the skins and hides in a tan liquor made from the digestion of the before-mentioned plants, and the accompanying treatment of the skins and hides, by their immersion in the preparing liquid, the whole process being conducted in the manner set forth, whereby the valuable properties of the plants may be preserved for use—and this we claim, whether the above described tan liquor be used separately, or in connexion with other substances containing tannin.

329. Gold Amalgamators; Henry Brevoort, San Francisco, California.

Claim—The drag, having upon its lower surface or shoe the combination of the blocks of rubbing sur-

faces and channels, the two being arranged reciprocally in the manner described. Also, combining with a revolving drag, a pan, whose bottom is inclined, and has the form of a circular trough, so as to collect the mercury in mass. Also, combining an amalgamating pan and revolving drag with a galvanic battery, arranged in such manner that its poles are extended into the mass of material in the pan, and that the parts of the material are subjected in succession to the action of the galvanic current. Also, the employment of a solution of the nitrate of mercury in connexion with a galvanic battery and a friction amalgamator containing mercury.

330. Quartz-crushing Machines; Henry Brevoort, San Francisco, California.

Claim—The relative arrangement and combination of the curved grinding shoes, having their front edges beveled and inclined backwards from their outer corners, and caused to revolve so as to gather in and return the coarser fragments towards the centre of the series. Also, the arrangement and combination of a series of grinding shoes, with their front edges curved or inclined backwards, with a corresponding inner series of reducing shoes, so that the coarser fragments are re-delivered in an inward direction to the reducing shoes, while the grinding and outward movement of the fine particles proceed continuously.

331. Gun Lock; William Briggs, Norristown, Pennsylvania.

Claim—Constructing the stock and breech of the barrel, so as to be susceptible of and united to each other by the tang or breech-pin and tapering screw-pin, and the spring hammer-guard and trigger, arranged and combined with the stock, in the manner set forth.

332. Water Metre; B. S. Church, Manhattanville, New York.

Claim—1st, The arrangement of a drum with the chamber and buckets, in combination with the trough and air chamber, and operating as set forth. 2d, The arrangement and combination of the trough, the pipe, the chamber, the air chamber, and the drum, to operate as specified.

333. Carriage Springs; H. S. Clark, Wyalusing, Pennsylvania.

Claim—The arrangement and combination of the U-shaped leaves with the elliptical springs, so that the extremities of the leaves will approach each other, and will be secured to the centres of the springs.

334. Washing Machines; F. J. Crissey, Leesburg, Virginia.

Claim—The arrangement of frame, supports, i i, upright shaft, rollers, supports, c c c, and collar, in combination with the bottom of the tub, arranged as set forth.

335. Valve for Steam Engines; Addison Crosby, Fredonia, New York.

Claim—The employment, as an induction or eduction valve in a steam engine, of a rolling or oscillating valve, composed of two segments, having their faces eccentric to its axis of oscillation, and with an opening between the segments.

336. Elastic Cloth; Horace H. Day, City of New York.

Claim—The new elastic cloth, consisting of stockinet cloth, elastic gum, and flock, combined so that the elastic gum is covered on one side by the stockinet, and so on the other by the flock.

337. Scroll-sawing Machine; Samuel De Vaughan, Washington City, D. C.

Claim—The vertical plates, g, and guide blocks, plates, m and m′, and guide arm, for the purpose of a compound guide. Also, the manner of operating link on bearing, in combination with block and guide arm, for the purpose set forth.

338. Harvesters; J. A. Falk, Andrew Johnson, and G. A. Erickson, Altona, Illinois.

Claim—The arrangement of the wheel, which is provided with the pin near its periphery, with the bar and pulley, constructed for the purpose of operating the band which drives the endless belt.

339. Ophthalmic Vapor Apparatus; T. F. Frank, Ischua, New York.

Claim—The ophthalmothological vapor bath, constructed and operating as described, for producing medicated vapor.

340. Faucets; Albert Fuller, Cincinnati, Ohio.

Claim—Encasing an elastic plug valve in the above described metallic shield, for the purpose set forth.

341. Machine for Cutting and Screening Bituminous Limestone or Asphalt; Quincy A. Gilmore, City of New York.

Claim—1st, The rotary cylinder or drum, carrying knives or cutters of the form described, arranged in rows, either with or without the raised bands, or in rows parallel or oblique to the axis of the cylinder, for cutting asphalt, sometimes known under the name of bituminous limestone. 2d, The application of the machine as a whole, to the purpose of cutting and screening asphalt or bituminous limestone.

342. Cord Guides for Sewing Machines; A. Golay, Mobile, Alabama.

Claim—The arrangement and combination with the adjustable plate, of the groove and guides, so that the cord may be guided and conducted between two or more thicknesses of cloth.

343. Flour Bolts; Elias Graham and I. N. Patton, Elizabethtown, Kentucky.

Claim—The combination of the wedged sliding ribs with the rods and screws for adjusting the same, in the manner set forth.

344. Billiard Cue-tip; J. H. Green, Christiansburg, Iowa.

Claim—A tip or point for billiard or bagatelle cues, made of any compound described, so as to dispense with the external application of chalk, or other substance, to the point of the cue.

345. Hollow Grate-bar for Steam Boilers; Benjamin L. Griffith, Reading, Pennsylvania.

Claim—Two or more tubes attached to hollow boxes connected to the fire-box, by means of hollow perforated screw plugs, and arranged in sets to complete the grate.

346. Breech-loading Fire Arms; Henry Gross, Tiffin, Ohio.

Claim—1st, Giving the chamber its longitudinal motion upon a bed-piece, which remains fixed during such motion, and in revolving carries with it the chamber. 2d, The roller, or its equivalent, upon the cheek-piece, and its combination with the groove. 3d, The double eccentric head of the lever, when connected with the chamber and bed-piece. 4th, The adjustable bearing piece for the eccentric of lever.

347. Fastening for Hoop Skirts; Albert W. Hale, City of New York.

Claim—The method of connecting and fastening the ends of the hoops by means of the cap, one part of such cap, with the end of the hoop, forming a point or extension to enter a recess in the cap on the other end

of the hoop; and such cap also furnishing the recess to receive the said points or extension of the other end of the hoop, when the cap and hook are bent, in the manner described.

348. ESCAPEMENT FOR CHRONOMETERS; William W. Hammond, City of New York.

Claim—The employment of the hollow semi-cylinders on the vibrating lever, in combination with the escapement wheel, and the balance and verge. Also, in combination with the escapement, as described, or any equivalent therefor, the employment of the holding spring.

349. SEWING MACHINES; James Harrison, Jr., City of New York.

Claim—1st, The combination of the frame or feeding lever, j, bar, m, spring, o, and regulating screw, p, with the needle and needle frame for carrying the mechanism for rotating the needle. 2d, The adjustable bar or band affixed to the lever or frame, J, in combination with the frame, i, for controlling the upward movement of the feed lever. 3d, The bar or band, in combination with the bar, m, screw, p, spring, o, and lever, j.

350. BED-BOTTOM; Royal Hatch, Strafford, Vermont.

Claim—The arrangement of a central supporting bar with a sacking, both provided with double loops, and attached respectively to the bedstead.

351. SPRINGS FOR RAILROAD CARS, &c.; Alexander Hay, Philadelphia, Pennsylvania.

Claim—1st, The construction of vulcanized india rubber springs, in which the threads, or warp, or fabric out of which they are formed, is made non-elastic before it is woven or knit. 2d, In combination with india rubber springs, to be acted on by tension or stretching, I claim the tubes with their flanches. 3d, In combination with the springs, acting as described, I claim the supporter with the opening in each end, and holes for tightening the spring.

352. METALLIC RAZOR-STROP; Milo A. Holcomb, Granby, Connecticut.

Claim—A razor-strop made of polished steel of the requisite degree of hardness, when possessing a sufficient degree of flexibility to enable the angle at which its surface forms with the edge of the razor to be lessened to the desired extent.

353. MACHINERY FOR WINDING WARPS UPON THE BEAM; Daniel Hussey, Nashua, New Hampshire.

Claim—The peculiar combination for maintaining uniformity of wind, or surface speed of wind, on the yarn beam, the same consisting of the friction wheels, the lifter rack, the pinion, and the compound motion mechanism, or their mechanical equivalents, applied to the yarn guide rollers, and the mechanism for adjusting the yarn beam, in manner specified.

354. FURNACES FOR SMELTING ZINC ORES; Joseph and Isaac Kalbach, Bernville, Pennsylvania.

Claim—Constructing the crucible with a detachable bottom, and attaching it to the arch of the cylinder or collar and to the bed-plate, by the rings or annular plates, whereby we are enabled to empty the crucible at its bottom, and to remove the entire crucible through the bottom or the arch of the heat chamber, as may be required.

355. MACHINES FOR HOLDING STONES; Ebenezer B. Knight, Malden, New York.

Claim—Providing the stone-holding machine with the suspending arms, plates, rod, and adjusting bolts, or their equivalents, whereby said machine may readily be adjusted vertically and also horizontally, in the arc of a circle.

356. WIND-MILL; Charles Livingston, Redwood City, California.

Claim—The cowl, with tubes and wheel combined and arranged for joint operation, as set forth.

357. CHUTE FOR HORIZONTAL WATER-WHEELS; Isaac Mallory, Etna, New York.

Claim—Constructing and arranging the scroll within the penstock, so that it can be turned, so as to partially close the orifice for the admission of water upon the buckets, and to thereby regulate the flow of water for any head, or for any quantity of water.

358. CURING AND TREATING CAOUTCHOUC; E. E. Marcy, City of New York.

Claim—The improved process of curing india rubber by combining with the sulphuret of lead and carbonate of lead, or the protoxide of lead, in the manner hereinbefore described, and without the use of free sulphur, in combination with the rubber or with said compound, and the exposure of these compounds to steam or water at the temperature hereinbefore stated, and in the mode pointed out.

359. CURING AND TREATING CAOUTCHOUC; E. E. Marcy, City of New York.

Claim—The improved process of curing india rubber by combining it with the sulphuret of zinc and the hyposulphite of zinc, in the manner hereinbefore described, and subjecting the compound to steam and water, at the temperature stated, without the use of free sulphur, in combination with said compound.

360. CURING AND TREATING CAOUTCHOUC; E. E. Marcy, City of New York.

Claim—The improved process of curing india rubber, and producing an improved article of india rubber, by combining india rubber with the hyposulphite of zinc, in the matter hereinbefore described, and without the use of free sulphur, in combination with the rubber, or with said compound, and the exposure of this compound to steam or water, at the temperature hereinbefore stated, and in the mode pointed out.

361. MACHINES FOR PICKING MILL-STONES; R. D. Nesmith, Franklin, New Hampshire.

Claim—The spring upon rod, provided with head for limiting the extent of its action upon the picks, as arranged with the inclined plane and cam, and the operating parts with which they are connected, in the manner specified.

362. APPARATUS FOR MANUFACTURING ILLUMINATING GAS; Samuel Nowlan, City of New York.

Claim—The gas exhaust and expelling wheel, interposed between the retort and the condenser, so as to operate in the manner set forth.

363. APPARATUS TO PHOTOGRAPH ON UNEVEN SURFACES; John H. Pein, Hoboken, New Jersey.

Claim—Photographing on vases, or other uneven solids, by means of an apparatus herein described, and in the manner set forth.

364. GELATINIZING OILS; Edmund Queru, City of New York.

Claim—The jellification of castor oil by means of the process described.

365. TINMAN'S MACHINES; Charles H. Raymond, Southington, Connecticut.

Claim—The movable and adjustable stand and its revolving box, when combined with shaft, cap-plate, and screw, in the manner described.

366. FURNACE AND VENTILATOR; Charles B. Sawyer, Fitchburgh, Massachusetts.

Claim—Providing the fire-pot with a series of small holes or openings, as set forth.

367. ORE CONCENTRATOR; Edward L. Seymour, City of New York.

Claim—1st, The rotating sieve, in combination with the bellows, or their equivalents, operated by the act of rotation of the former. 2d, The application of two or more rotary sieves, combined with such an arrangement of "waste tubes," that the refuse of the upper sieve shall be led to constitute the supply or feed of the sieve next below it. 3d, Rendering the receiving mouths of the "waste tubes" adjustable. 4th, The use of the closed chambers or "traps" below the sieves, as described.

368. COMPOSITION FOR DESTROYING INSECTS INJURIOUS TO FRUIT TREES; Philo B. Sheldon, Prattsburgh, N. Y.

Claim—Combining and employing the ingredients herein described, in substantially the mode and proportions set forth, for the purpose of destroying borers, and other insects on fruit trees.

369. LETTER FILE; J. H. Shipman, Yorkville, New York.

Claim—The arrangement of the movable hinged guards, in combination with the metal back and points, as described.

370. HOSE COUPLING; William H. Smith, Newport, Rhode Island.

Claim—The hose coupling described, made by combining the open spiral flanch with a screw, as set forth.

371. STOVE URNS; James Spear, Philadelphia, Pennsylvania.

Claim—The arrangement of the register in the base of the urn, with the ornamental receptacle for the cup, constructed in the manner described.

372. CHURNS; A. L. Sperry, Auburn, Indiana.

Claim—The arrangement of the hook and button, to operate in combination with the dasher and breaker frame, in the manner specified.

373. ROTARY PLANING CUTTER; Henry D. Stover and J. W. Bicknell, Boston, Massachusetts.

Claim—The adjustable revolving guard, as constructed and connected adjustably to the cutter head, carried by and having all its movements to effectually protect the operator from mutilation, and to hold down the material receiving shape, in the manner set forth.

374. STONE SAWS; Peter Sweeney, Buffalo, New York.

Claim—The employment of two plates, in combination with the dish-formed cutter, arranged as described.

375. SHINGLES; Joseph Sweetser, Biddeford, Maine.

Claim—The fluting of the shingles.

376. AUGER FOR CUTTING ROUND TENONS; George Taylor and George H. Burger, Worthington, Ohio.

Claim—The arrangement and combination of the spring with the shank and tube, as described, whereby the plug is rendered self-acting.

377. FEED-WATER APPARATUS FOR STEAM BOILERS; Joseph B. Thompson, Warrenton, Georgia.

Claim—The exterior water chamber, communicating with the supply tank by pipe, and with the boiler by force pump and pipe, and provided with a valve, in combination with the peculiarly constructed float, rods, and lever, operating as specified.

378. FIRE-PLATING IRON; William H. Thoss, San Francisco, California.

Claim—Preparing the iron after it has been cleaned with dilute acid, by immersion in a solution of borax, and after being dried, passing it through the molten copper, maintained at the required heat in a furnace, constructed with a roof to concentrate the heat over the basin of molten copper, and with an aperture at one side to insert the iron to be plated, and a corresponding one on the opposite side, to receive the iron as it is drawn from the copper plate, as described.

379. HEMP BREAKES; William A. Vertrees, Winchester, Missouri.

Claim—Constructing the rocking breaker frame of hemp or flax breakers, in the manner described, and operating it by means of a slotted pitman, in such manner as that while the vibratory motion is communicated from the prime motor to the breakers by machinery, yet they fall on the hemp or flax with a free stroke or flail motion.

380. SHINGLE MACHINE; Nathaniel Waterbury, Fond du Lac, Wisconsin.

Claim—1st, The reciprocating bolt carriage, tilting beds, circular saw, and sliding jaws, arranged relatively with each other as shown, and operated respectively by the cam, cam ratchets, and pendants, belt, and levers and weights. 2d, In connexion with the reciprocating belt carriage, saw, and tilting beds, the bar, provided with inclined slots, and connected with the frames of the jaws, by means of the pins fitting in said slots for the purpose of elevating the bolts during their return movement. 3d, The employment or use of the cam ratchets attached to the framing, in connexion with the pendants attached to the reciprocating bolt frame, arranged for automatically tilting the beds.

381. MACHINE FOR COILING METAL PIPE; Peter L. Weimer, Lebanon, Pennsylvania.

Claim—1st, The coiling cylinder with the peculiar shaped groove, arranged as described. 2d, The arrangement of the two guide wheels, triangular piece, and shaft, when used in combination with the coiling cylinder, and for the purpose described. 3d, The movable plate and jack-screws, for the purpose of adjusting the guide-wheel shaft to any angle required.

382. SKATES; Asa Wheeler, Brattleboro', Vermont.

Claim—The arrangement and combination of the adjustable heel-piece, heel-case, stock, screw, and front straps, as described.

383. FEED-WATER HEATERS FOR STEAM BOILERS; John M. White, City of New York.

Claim—The arrangement of the division chamber, supply and discharge pipes, and heating pipes, placed within the exhaust side pipe, in combination with the relief pipe, by which, when necessary, the water may be passed directly to the boiler without being passed through the heating pipes.

384. HARVESTERS; Abner Whitely, Springfield, Ohio.

Claim—1st, So arranging the mechanism of the automatically operating door or shutter, for preventing scattering and admitting the gavels to be discharged at regular intervals, as to permit the attendant to increase the intervals of time for the discharge of the gavels where the grain is thin upon the ground. 2d, The

combination of the rake with the door or shutter, for discharging the gavel at the time the door or shutter is opened for the purpose, whether it is at regular intervals or less frequently.

385. Shears for Separating Paper; Jeptha Avery Wilkinson, Brooklyn, New York.

Claim—1st, Separating paper, or other material, by the joint operation of a revolving shear and a stationary surface, when said stationary surface is so formed and placed as gradually to approach the path described by the shear in its revolution, and compress the said paper, or other material, on to the edge of said revolving shear, in the manner specified. 2d, The elastic roller or rollers, in combination with the stationary surface and revolving shear on the cylinder, whereby the paper is passed through and separated progressively as at two operations. 3d, The arrangement of the shaft carrying the rollers, the springs, and cams, for elevating the rollers and preventing traction on the paper.

386. Turn-outs for Railways; Frank C. Brown, Assignor to Wm. Brown, Philadelphia, Pennsylvania.

Claim—The addition of grooves on the circumference of car wheels, as now constructed, with a single flanch and tread, and the placing of curved bars at turn-outs on the track of the road, to enter and operate on such grooves for the purpose of changing the direction of cars.

387. Machinery for Hardening Hat Bodies; Seth Boyden, Assignor to self and H. H. Jacques, Newark, New Jersey.

Claim—1st, The employment of a cloth, or its equivalent, in combination with a cone, in the manner described. 2d, The arrangement and combination of the frame, shaft, J, eccentrics, h', rods, i, tubes, arms, shaft, K, eccentrics, p, rods, q, bars, cloth, so that the cloth will be operated with a compound movement.

388. Rotary Harrows; William P. Goolman, Assignor to self, S. B. Morris, and Wm. Hollingsworth, Dublin, Indiana.

Claim—1st, The described application of friction rollers between rotary concentric harrows, to elevate opposite sides of the respective harrows. 2d, The reversible arm, arranged between concentric harrows to change the direction of the rotation of the said harrows. 3d, The reversible bent spindle, adapted in the manner set forth, to correspond with the relative obliquity of two concentric harrows. 4th, The described arrangement of the friction rollers and adjustable washer on the arm, operating in the manner set forth, to vary the relative obliquity of the harrows.

389. Wrenches; Daniel G. Greene, North Bridgewater, Assignor to self and William Nash, South Weymouth, Massachusetts.

Claim—The combination of the movable jaw, inclined shoulders, U, with the pawl and inclined shoulders, V, and enlarged hole, and ratchet teeth, arranged in the manner set forth.

390. Shears; Michael Irion, Utica, Assignor to self and Jacob Heidel, Oneida County, New York.

Claim—The combination of the cutting plates, the circular punch, and the circular die, to receive the punch, and surrounded by a cutting edge, in connexion with a pair of movable jointed arms, arranged in the manner set forth.

391. Lamps; George Marlow and Michael Ralphe, Assignors to A. D. Brown, U. C. Valette, and George Marlow, Cincinnati, Ohio.

Claim—1st, The arrangement of the separate cup-formed back reflector upon the inside of the door, with an open-backed parabolic or conical reflector. 2d, The described arrangement of glazed doors, M and M', hinged vertically to the front angles of the lantern, and adapted in the manner set forth, to be fixed either in front of the lantern or against one or other of its sides.

392. Piano-forte Actions; Theodore Marschall, Assignor to Lighte & Bradbury, City of New York.

Claim—The spring-supporting post, when used in the described combination with a stud, separate and distinct from the moving parts to detain the hammer at any determined height, while the jack descends sufficiently to re-engage beneath the hammer butt.

393. Churns; E. L. Pratt, Assignor to self and R. B. Fitts, Philadelphia, Pennsylvania.

Claim—In combination with the rotary case or body of a churn, a diaphragm or piston, adapted both to move upon and be moved by a screw shaft, or its equivalent, placed horizontally in the said case, as described, the said diaphragm and shaft being constructed as set forth. Also, the series of perforatons through the diaphragm or piston, in combination with the movable perforated adjusting disc or plate, or their equivalent, the same operating together in the case, as described.

394. Cotton Gins; Wm. F. Pratt, Assignor to the E. Carver Company, East Bridgewater, Massachusetts.

Claim—The use of a naked or unshielded auger or cleaver, operating in the end of a ginning roll of a cotton gin at or near the centre thereof, in the manner described.

395. Grain-binding Mechanism; Allen Sherwood, Assignor to E. P. Lenter, A. H. Goss, Wm. Hills, and Ameretta Sherwood, Auburn, New York.

Claim—The combination of the shield and lever, both removable and located at one side of the delivery portion of the platform, so that the shield shall protect the lever from the cut material, and from one side of an open-ended grain receiver (the fence forming the other side thereof), where the grain is deposited previous to being bound. Also, in combination with the raker's stand and binder's seat, the shield and lever, so arranged that the raker, from his stand, may sweep the cut grain into the receiver, and the binder, from his seat, reaches beyond the receiver to catch the lever. Also, in combination with the grain receiver, the inclined ledges, under which the wire is passed, so as not to catch or interfere with the entrance of the grain therein. Also, the slot and flanches in the shield, said flanches serving as a guide for properly bringing down the foot of the lever to insert the wire in the twisting wheel. Also, in combination with the lever, the clamp, located in close proximity to the handle, so that the binder, as he draws up the gavel, may check the paying-out of the wire, and thus bring it tightly around the bundle. Also, the combination of a removable shield and lever, on the platform, with a removable twisting mechanism on the fence or side of the platform, for the purpose of adapting an ordinary hand delivery mowing machine into a self-binder, or vice-versa, without in any manner altering the parts which enables it to be so exchanged, except to attach or detach them, as set forth.

396. Nail Machines; Daniel Dodge, Keeseville, New York.

Claim—The combination of an anvil and fixed die, or other equivalent fixed surfaces, a roller, hammers, and a vibrating guide. Also, the operation of a hammer, in combination with the roller and anvil, by means of an eccentric on the roller shaft, and a universal joint at the connexion of the hammer with the connecting rod of the eccentric.

DISCLAIMER.

1. GAS BURNERS; William Blake, Boston, Massachusetts; patented August 9, 1845; disclaimer filed August 5, 1859.

I hereby enter my disclaimer to that part of said burner which was set forth and claimed as the "bell shape or mouth of the lower part of the inner case of said burner."

EXTENSIONS.

1. GAS BURNERS; Wm. Blake, Boston, Massachusetts; patented August 9, 1845; extended August 9, 1859.

Claim—The combination with the space directly beneath the orifices of discharge of the gas, and with the supply or branch tubes, an expansive chamber, so as to operate in the manner set forth. Also, making the lower part of the inner case of the burner with a bell-shaped opening or mouth, in the manner specified.

2. GRINDING MILLS; Beriah Swift, Washington City, D. C.; patented August 16, 1845; extended Aug. 16, 1859.

Claim—Making the grinding teeth of mills, in concentric rows, projecting from the surface of the plates, so that the teeth of one plate shall run in the spaces between the teeth on the other, and vice-versa, in combination with the grooves or furrows running towards the periphery of the plates, through which the substances acted upon are carried outwards, whether these furrows be arranged radially according to what is technically termed the eight quarter dress, or in any other manner leading from the inner to the outer range of teeth. Also, in combination with the teeth arranged as expressed in the above claim, the breaking the teeth on a cylinder or cone, arranged as described.

ADDITIONAL IMPROVEMENTS.

1. PLOUGHS; George Watt, Richmond, Virginia; patented February 9, 1858; additional dated Aug. 2, 1859.

Claim—The combination of the eccentric roller, beam, notches, and cuff, substantially as set forth.

2. LOCK; A. A. Richards, Urbana, Ohio; patented Feb. 15, 1859; additional dated August 9, 1859.

Claim—The arrangement of the spring, collar, ring, screw, brake-wheel, and arbor, in the manner described, so as to produce friction between the ring, and wheel, and arbor, and also the arrangement of the brake, indented flanch, and stem, so as to prevent the revolution of the wheel, and arbor, and ring, and the external dial hand.

3. INSTRUMENTS FOR TAKING ALTITUDES OF THE SUN; Frederick Yeiser, Lexington, Kentucky; patented Feb. 8, 1859; additional dated August 9, 1859.

Claim—In combination with the rotary bar, the arrangement of the adjustable bar and dial plate, and rotary cylinder, and adjustable disc, in connexion with the bar, k, and plates, a a', holding the lens, and having on its face a small square to receive the sun's image through the lens, in such relation to each other and to the rotary bar, that it operates as specified.

4. MOLE PLOUGHS; Moses Bales, Big Plain, Ohio; patented Feb. 15, 1859; additional dated Aug. 23, 1859.

Claim—The employment of the cap, in combination with the mole, arranged as set forth.

5. APPARATUS FOR EVAPORATING SACCHARINE JUICES; L. P. Harris, Mansfield, Ohio; patented Jan. 18, 1859; additional dated August 23, 1859.

Claim—The application of partial, transverse, or oblique partitions to evaporating pans, for the purpose of preventing a continuous transverse channel, arranged in the manner described.

6. MODE OF OILING JOURNALS; Douglas B. Jordan, Cumberland, Rhode Island; patented March 15, 1859; additional dated August 30, 1859.

Claim—1st, The hinging the dish or bucket to the rod, as set forth. 2d, The dish or bucket, in combination with the several parts marked C D E F and I, for the purpose set forth and described.

RE-ISSUES.

1. BALANCING MILL-STONES; John Fairclough, Louisville, Kentucky; patented Dec. 21, 1858; re-issued Aug. 2, 1859.

Claim—The employment or use of weights placed within boxes or recesses in the back of the stone, and arranged so that they may be adjusted vertically, and more or less be used in each box or recess to admit of the balancing of the stone or runner, both while in motion and at rest.

2. NAIL MACHINE; Jahaziah S. King, Raynham, Massachusetts; patented October 20, 1857; re-issued August 2, 1859.

Claim—Making cut nails in such a manner that each nail will be seized the instant after it is cut from the nail plate, and be compressively operated upon at the point thereof, in the manner specified, to bring the flat point of said nail plate to an equal-sided sharp point, or to substantially the same character of point that is ordinarily given to wrought nails.

3. MACHINE FOR MATTING THE ENDS OF MATCH BLOCKS; Henry E. Pierce, Charlemont, Massachusetts; patented Jan. 10, 1854; re-issued August 2, 1859.

Claim—Matting the ends of match blocks by pressure of a roller or rollers, for the purpose set forth, and in this claim I wish to be understood that I do not confine myself to the precise arrangement of the parts described, but shall vary them at pleasure, while I attain the same ends by means substantially the same.

4. CLOTHES DRYER; Stephen H. Tift, Morrisville, Vermont; patented July 20, 1858; re-issued Aug. 2, 1859.

Claim—The combination of the slotted, perforated hub, and slotted, bored cap-hub, with the arms and braces connected with the hubs by wires, as described, and the arrangement of the same with the shaft, collar, and ratchet catch.

5. PLOUGHS; George Watt, Richmond, Virginia; patented Feb. 9, 1858; re-issued August 2, 1859.

Claim—Constructing mould-board and land-side of cylindrical surfaces of equal diameters, intersecting along the cutting edge of the plough, in combination with the standard curving landward from the top of the mould-board to a position nearly over the base of the land-side.

6. Breech-loading Ordnance; G. W. Bishup, City of New York; patented March 8, 1859; re-issued August 16, 1859.

Claim—Combining the movable breech-pin with the bore of the cannon, by means of movable locking or abutting pieces or segments, and which, after the breech-pin is inserted, are shifted and made to cross the joint of the breech-pin and bore, to hold the breech-pin against the force of the discharge.

7. Ash-sifters; Allan Cummings, City of New York; patented March 8, 1859; re-issued Aug. 16, 1859.

Claim—The employment of a conical sieve, or sieve of an equivalent form, in combination with the two receptacles, one for the sifting and the other for the substances sifted. Also, the conical deflector for deflecting the substances to be sifted, and concentrating them in combination with the spreader, whether the spreader be itself the sieve or employed with the sieve below. Also, in combination with the sieve, the under conical surface of the deflector for preventing the escape of dust from the apparatus. Also, in combination, the deflector, the spreader, the conical sieve, and the receptacles for the siftings and the substances sifted.

8. Sash-fastener; Ralph J. Falconer, Washington City, D. C.; patented August 31, 1858; re-issued August 16, 1859.

Claim—Extending the cap portion of the catch over and along the front edge of the catch-plate, to form a catch-opening flush with the edge of plate, so that the window cannot be unfastened without having the point of the hook withdrawn entirely clear from the meeting rail of the upper sash, and out of the way of the bars above when the lower sash is raised. Also, in combination with the catch, hook, and plate, I claim the check, or equivalent thereof.

9. Valve Cocks; J. R. and H. S. Robinson, Clinton, Massachusetts; patented Aug. 31, 1858; re-issued August 16, 1859.

Claim—1st, The method of constructing valves, valve cocks, and gates, so that, when the port or ports therein are uncovered, there shall be a straight passage or passages from the induction port or ports in the valve chamber to the eduction port or ports in the same, whether the valves in such valves, valve cocks, and gates, are made in one or more than one piece. 2d, Making the valves in valves, valve cocks, and gates, in separate or detached pieces.

10. Machines for Making Paper Bags; Francis Wolle, Philadelphia, Pennsylvania; patented July 6, 1858; re-issued August 16, 1859.

Claim—1st, The combination of the creaser and lappers, arranged and operating in the manner described. 2d, The folding of a lap in the manufacture of a bag of paper, or other material, by means of a creaser blade and two rolling surfaces, operating in combination with each other. 3d, The revolving lapper shaft, in combination with the creaser, the feeding roller, and aprons, the creaser being brought into operation on the lap during the intermission in the motion of the feed rollers.

11. Treating Caoutchouc and other Vulcanizable Gums; Conrad Poppenhusen, City of New York, Assignee of L. Otto P. Meyer, Newtown, Connecticut; patented April 4, 1854; re-issued August 16, 1859.

Claim—The mode of operation, as described, which said mode of operation consists in the employment of a pliable or flexible envelope, or the equivalent thereof, applied by pressure to the hard compound of vulcanizable gum, while in the green or plastic state, so as to insure the contact of such covering with the surface of the compound, and while thus covered or protected, subjecting it to the vulcanizing heat, and when vulcanized, stripping off such covering.

12. Refining Iron in the Heat of a Blast Furnace; Christian Shunk, Canton, Ohio; patented May 17, 1859; re-issued August 16, 1859.

Claim—The employment, immediately before the tapping of the furnace, of an auxiliary tuyere pipe or pipes within the hearth of the common blast furnace, when charged with molten iron, at such an inclination as to cause the blast of air to commingle with the particles of iron, and give to the whole mass in the hearth a spiral or rotary motion.

13. Billiard Table Cushions; H. W. Collender, City of New York; patented December 8, 1857; re-issued August 23, 1859.

Claim—Composing cushions for billiard tables, with a body or back of what is known as the soft compound of vulcanizable india rubber or allied gum, in combination with a facing of india rubber or allied gum, rendered less compressible by fibrous matter, or the equivalent thereof.

14. Railroad Station Indicators; C. A. McEvoy, Richmond, Virginia; patented Nov. 20, 1855; re-issued August 23, 1859.

Claim—Presenting a movable sign or symbol to passengers of a railroad car, so that both sides of said sign shall be visible, and utilized as annunciators by passing each sign in turn through an opening of the case, by the revolving of the drum to which the said signs are attached.

15. Faucets; James Powell, Cincinnati, Ohio; patented March 22, 1859; re-issued July 5, 1859; re-re-issued August 23, 1859.

Claim—1st, The valve stem, formed with projecting flanches, when confined to a rectilinear path and operated by a cam or eccentric, which engages with it at two opposite points, in the manner set forth. 2d, The arrangement and combination of the slotted head, pivot, socket, and cam, operating in the manner set forth, to prevent lateral motion of the valve stem.

16. Lamps; Michael A. Dietz, Brooklyn, New York; patented May 3, 1859; re-issued August 30, 1859.

Claim—Combining the deflector with the chimney band by mechanical devices, so as to retain the former in its proper relative position without the use of solder.

17. Device for Converting Reciprocating into Intermittent Rotary Motion; Henry Ehrenfeld, City of New York; patented June 21, 1859; re-issued August 30, 1859.

Claim—1st, Arranging the lever and dog, in combination with the grooved wheel, or its equivalent, in such a manner that said lever and dog act on the wheel, without a connexion to the centre or hub of the wheel. 2d, In combination with the lever, dog, and wheel, the arrangement of the groove, or its equivalent, in the hub of the wheel. 3d, Arranging the lever with the dog permanently attached to it in such a manner that the direction of the said lever, when it is in its place, makes an angle of 90°, or nearly so, with a line drawn from the centre of the wheel through the dog.

18. Harrows; Sidney S. Hogle, Cleveland, Ohio; patented March 7, 1857; re-issued August 30, 1859.

Claim—Causing the points of the teeth of a rotating harrow to descend deeper into the ground on one side of their axes of rotation than they do on the opposite side of the same, for the purpose of enabling the

dragging force which may be exerted upon said harrow, to impart a positive rotary motion thereto without the aid of gearing wheels.

19. ERASER AND PENCIL-SHARPENER; Archibald G. Shaver, Hartford, Connecticut; patented March 8, 1859; re-issued August 30, 1859.

Claim—1st. The curved blade eraser, as specified, forming on one side a convex surface. 2d, In combination therewith, the pencil-sharpener and pointer, as described.

DESIGNS.

1. PARLOR STOVE; Robert Ham, Assignor to Smith, Shelden & Co., Troy, New York; dated August 9, 1859.

2 and 3. CARPET PATTERNS (two cases); E. J. Ney, Assignor to the Lowell Manufacturing Co., Lowell, Mass.; dated August 9, 1859.

4. PARLOR COAL STOVE; Isaac de Zouche, St. Louis, Missouri; dated August 9, 1859.

5. TABLE FORK; N. E. Russell, City of New York; dated August 9, 1859.

6. STOVES; Garrettson Smith and Henry Brown, Assignors to Cox, Whitman & Cox, Philadelphia, Penna.; dated August 16, 1859.

7 and 8. FLOOR OILCLOTH (two cases); James Bogle, West Newton, Massachusetts, Assignor to self and Daniel Bogle, Dover, New Hampshire; dated August 23, 1859.

9. SPOON OR FORK HANDLES; Henry Hebbard, City of New York; dated August 23, 1859.

10. SCALES; Francis M. Strong and Thomas Ross, Brandon, Vermont; dated August 23, 1859.

11. FLOOR OILCLOTHS; Jean Baptiste Virolet, Assignor to John W. Hoyt, City of New York; dated August 30, 1859.

12 to 14. CARPET PATTERN (three cases); Henry G. Thompson, City of New York, Assignor to the Hartford Manufacturing Co.; dated August 30, 1859.

15. THREE-PLY CARPET PATTERN; Henry G. Thompson, City of New York, Assignor to the Hartford Manufacturing Co.; dated August 30, 1859.

SEPTEMBER 6.

1. LAMPS; H. W. Adams, Brooklyn, New York.

Claim—Constructing the upper end of the wick tube with the elevated ends, so as to enclose the ends of the wick and prevent said ends from burning too high, when the central part is sufficiently elevated above the central part of the wick tube to be allowed to burn.

2. APPARATUS FOR MAKING DECOCTIONS; William Adamson, Philadelphia, Pennsylvania; ante-dated April 6, 1859.

Claim—The conical roller arranged within the caldron, when the same is used for the purpose of thoroughly intermixing the ingredients to be extracted during the process of boiling.

3. CUTTING APPARATUS OF HARVESTERS; T. D. Aylesworth, Ilion, New York.

Claim—The cutters and guards, when constructed and operating together without any motion except that of being advanced or drawn over a field.

4. TONGUEING AND GROOVING MACHINE; H. H. Baker, New Market, New Jersey.

Claim—The employment of flanched feed rollers, having a lateral play, and acted upon by suitable springs, in combination with the fixed intermediate rings or flanches, or their equivalents, in the manner specified.

5. RAILROAD EXCAVATORS; E. O. Baxter, Foreston, Illinois.

Claim—The arrangement and combination of the adjustable timbers or arms, plough and excavator, when employed in the manner shown, for the purpose of loosening and removing the earth, and keeping the ditch free from the wash of the slopes on railroads.

6. TURNING; Jehu Brainerd and W. H. Burridge, Cleveland Ohio.

Claim—The use of the described compound for tanning, consisting of a solution of the named mineral salts, in mixture with a solution of tannin, either with or without the addition of aloes.

7. MAKING GAS FROM WOOD; L. R. Breisach, City of New York.

Claim—The process of manufacturing illuminating gas from wood, by distilling the same in two retorts of varying temperatures, one of which retorts is charged with charcoal, varying in amount according to the conditions indicated, the whole process being conducted as set forth.

8. RAILROAD WHEELS; Archibald Cameron, Charleston, South Carolina, and David Matthew, Philadelphia, Pennsylvania.

Claim—The peculiar construction of car wheels, having elastic curved arms, with chilled cast tread and cast hub, forming one combined wheel.

9. MACHINE FOR MAKING WATCH RIMS, &c.; C. W. Clewley, Providence, Rhode Island.

Claim—The combination of the male and female plungers, as described.

10. MACHINE FOR PRINTING THE ADDRESSES ON NEWSPAPERS, &c.; R. W. and Daniel Davis, Yellow Springs, Ohio.

Claim—1st, The arrangement of wooden blocks of suitable size for a single address, with indented letters in their faces, and attached by means of small tacks, or equivalent, to a flexible band or belt in close compact columns, and operated as described. 2d, The use of the triangular stationary bed-piece, over which the belt slides, by means of belt pulley, and regulated and adjusted by means of lever.

11. TREATING METALLIC ORES WITH SPONGY IRON; Jean Justin Albert de Bronac and Augustin Joseph Martial Deherrypon, Paris, France.

Claim—The treatment of metallic sulphurets, or other ores or metallic bodies, with a spongy iron, for purposes set forth, by the combination of the several processes specified in the order stated, viz:—1st, Pulverizing the ore and the spongy iron separately. 2d, Mixing the two powders in definite proportions. 3d, Compressing the mixed powders into the form of cakes or small bricks. 4th, Treating the thus prepared ores in suitable furnaces, as described.

12. Machine for Sawing Staves; R. Densmore, South Haven, Michigan.

Claim—1st, Surrounding the stationary drum with a series of saws all hung in one gate, and having the same movement, in combination with the rotating table, in the manner specified. 2d, In combination with the rotary table and drum, the sliding carriages, arranged radially around said drum, and operated automatically to feed the bolts up against the drum. 3d, The rolling spring guides, in combination with the drum for discharging the staves from the machine after they have been sawed.

13. Bagasse Furnaces; Charles A. Desobry, Plaquemine, Louisiana.

Claim—The combination of the upright air chamber, having a vertical partition wall, and the system of ducts, and the damper or shutter, applied in connexion with the fire chamber and the flue, or its equivalent.

14. Portable Evaporating Apparatus; Hugh T. Douglas, Zanesville, and John Cooper, Mount Vernon, Ohio.

Claim—The combination of the diving flue, the valves, and the damper, arranged in relation to the evaporating pan, and operating in the manner set forth.

15. Roofing Cement; M. D. Dubois, Newburgh, New York.

Claim—A composition formed of the ingredients or substances compounded, in the proportions and in the manner specified.

16. Boots; Lewis Duvall, Big Spring, Kentucky.

Claim—The described method of cutting the piece of leather, or other suitable material, and uniting the same with the gore, so that when it is folded in the lines b b′ and f f′, and if the gore is brought in the proper position, said piece, together with the gore, assumes the required shape of the upper of a boot.

17. Machine for Cutting and Finishing Shoe-heels; Wm. T. Edson, Philadelphia, Pennsylvania.

Claim—The combination of the movable post, the former (on the upper of the shoe), the guide, and the cutter wheel, or an emery or burnishing wheel, with the hand lever, bow guide, springs, and radius bar, for cutting or shaping, smoothing, and burnishing the heels of shoes, either before or after they are fastened to the shoe.

18. Automatic Rake for Reaping Machines; Benjamin G. Fitzhugh and McClintock Young, Jr., Frederick, Maryland.

Claim—The locating of an automatic sweep rake at the rear, left-hand, or outside corner of the platform, when said rake has a rising and falling motion that will admit of its passing over the outside division board or fence, and then drop into or on to the extreme outer end of the platform, and sweep it off the cut grain.

19. Foam-collectors for Steam Boilers; Thomas G. Gardner, Mount Pulaski, Illinois.

Claim—Fitting a boiler with one or more plates, so applied as to present inclined surfaces above the surface of the water, with one or more outlets for steam and foam, at the highest parts of said plate or plates, and as to provide a receptacle for foam above the said plate or plates.

20. Apparatus for Mashing; Edward Hæckel, Assignor to Hæckel & Co., Cincinnati, Ohio.

Claim—The described combination and arrangement of the central shaft and satellite shafts, the whole being armed with beaters, and rotated simultaneously.

21. Flood Gates; E. H. Hancock, Augusta, Georgia.

Claim—The combination of the flood or dam gate, tilting trough, and the draining structure, or its equivalent, as set forth.

22. Sewing Machines; Jason W. Hardie, City of New York.

Claim—1st, The method of making the "knot-stitch," by taking the needle-thread at the back of the needle, or at the side opposite to the position of the bobbin, and first doubling it upon itself around the needle and then looping it over the bobbin thread. 2d, The employment of two hooks, acting in opposite directions, when they take the thread at the back of the needle, or at the side opposite to the position of the bobbin, for the purpose of forming either the knot-stitch or the ordinary shuttle-stitch, by simply reversing the motion of the driving shaft. 3d, Making the feed eccentric self-adjusting by means of the loose sleeve, slot, and pin or stop, so that the feeding shall take place during the descent of the needle, whichever way the driving shaft may be turned.

23. Carpet-sweeper; Hiram H. Herrick, East Boston, Massachusetts.

Claim—1st, Providing the end of the box with a groove, as from x to x, when the same is used in connexion with the flaring brush on the end of the shaft. 2d, Dividing the box into two parts, and providing each with a partition dividing the bottom of the box in two parts, through which the brushes protrude, and providing these parts of said bottom with flanches which hold the dirt.

24. Amalgamator; Kelsey Hazen, Brooklyn, New York.

Claim—Compelling the water having the particles of gold in suspension to flow within a certain small distance of the heated mercury, under conditions as set forth. Also, in connexion with the above, the employment of a series of vibrating agitators and scrapers, acting in the space under E, and of an adjustable gate for regulating the facility of egress of the least suspended particles.

25. Mole-ploughs; Iris Hobson, Stout's Grove, Illinois.

Claim—The combination of a ditching plough beam, having a horizontal joint forward of the mole and coulter, with a rod arranged over the top of said joint, and with a horizontal, adjusting, and stop-plate.

26. Door-bolt; Lewis G. Hoffman, Waterford, New York.

Claim—The combination of a common door-bolt with a barrel containing a wheel, with an arm acting on a slot in the bolt, so that when operated by a key the door may be fastened or unfastened on the outside; the whole being so arranged as not to interfere with the ordinary mode of using the bolt on the inside.

27. Marine Propellers; Lorenzo Holtslander, Oberlin, Ohio.

Claim—The device described for changing valve seats as applied to water propellers, to reverse the motion of vessels or boats. Also, the combination of the small forward pipes with the reservoir, as described.

28. Apparatus for Printing the Address on Newspapers, &c.; George Hutchison, Alleghany, Penna.

Claim—1st, The inclined hopper with the slides or guides, in combination with the ways and conveyors on the belt, as described. 2d, The use of a metallic belt, furnished with the conveyors, as described. 3d, The arrangement of the pulleys, the belt, press-roller, and inking roller, as described. 4th, The use of the lug on the end of the type frame, when used in connexion with the notch in the conveyor, as described.

29. Parlor Grates; Damase Lamoreux, City of New York.

Claim—1st, So constructing the grate that the fuel box and the ash-pit are distinct from, and independent of, the bars, and capable of being removed, while the bars remain undisturbed, thereby enabling me to effect the removal of the ashes and cinders with much less trouble than by the ordinary mode, and thereby keep the apartment free from the dust and dirt which are inseparable from the common method of removal. 2d, The combination of the crank, the rod, and the movable bottom of the fuel box, arranged as described, by which any easy and convenient means of giving a reciprocating, horizontal, circular motion of the grate bottom is secured without the necessity of cutting an opening in front for the passage of an arm, by which to vibrate the grate. 3d, The arrangement, in a parlor grate, of the bottom grate upon which the fuel is supported, in the manner described, by which it is made capable of being vibrated through the back of the fuel box, upon a fixed axis placed entirely back of the space devoted to fuel, the wings of said bottom grate being so extended as to cover or compensate for the necessary vibration which is made into open space back of the fire box.

30. Method of Centering in Watchmaker's Lathes; Pierson Leffel and J. H. Mulholland, Springfield, O.

Claim—1st, A vibrating mandrel, arranged within a socket or hollow spindle, in such manner that its inserted end may fit closely within said socket, and its outer end allowed to vibrate. 2d, In combination with the vibrating mandrel, we claim the rocking collar, spring, key, and nut, arranged to operate as described.

31. Submerged Pump; Hosea Lindsey, Ashville, North Carolina.

Claim—The arrangement of the short reciprocating piston rod, open pistons, sliding ring valves, cylinder, having a conducting pipe, with the chain and brake, in the manner set forth.

32. Steam Pans for Clarifying Sugar; George M. Longacre, New Orleans, Louisiana.

Claim—In combination with the pans, the relief valve, and the check valve, arranged as set forth.

33. Lamps; Justus R. Loomis, Winsted, Connecticut.

Claim—The arrangement of the cylindrical corrugated skirting, perforated tubes, adjustable radiating wires, in the manner described.

34. Stoves; Edward M. Manigle, Philadelphia, Pennsylvania.

Claim—The arrangement of the series of distinct or uncommunicating hollow open air chambers, or their equivalents, in combination with the cross-piece of the top plate of a cooking stove, in the manner described, and this I claim whether the said cross-piece be either movable or stationary in the said top plate.

35. Machine for Wiring the Joints of Clothes-pins; Alvin C. Mason, Springfield, Vermont.

Claim—1st, The intermittently rotating pliers, in connexion with a clamping device formed of the jaws, recess, and lever, or their equivalents, and shears, arranged to operate as set forth. 2d, In combination with the pliers and shears, and clamping device, the sliding forks, arranged for joint operation. 3d, The particular manner of opening and closing the pliers, and operating the arbors, to wit: by means of the sliding cones in connexion with the springs and permanent bosses on the arbors, whereby the jaws of the pliers are opened and closed, and the arbors shifted by a very simple mechanism.

36. Brakes for Railroad Cars; Thomas J. Mead, Port Byron, New York.

Claim—The combined use of the U-shaped yoke, the brake bar, and the short brake blocks, for the purpose of adapting the brake to a simple lever that acts directly upon it.

37. Machine for Bending Wagon-tire; Wm. and Isaac H. Mosher, Greene, New York.

Claim—The clutch or clasp to hold the end of the bar, in combination with the former being made three-fourths of the circle, and the arrangement of the lever, for operating as specified.

38. Trunks; Jacob Parker, St. Louis, Missouri.

Claim—1st, Forming the lid of the trunk in the shape of a semi-cylinder, as specified. 2d, The impervious box or sponge-carrier, arranged in the tray as described. 3d, The peculiar formation of the division boards, in such manner that they will come down on to the rim of a gentleman's hat, placed in the middle hat box.

39. Bits for Cutting Washers; Henry Pennie, Buffalo, New York.

Claim—1st, The arrangement of the cutters upon the ends of the sliding bars, and at right angles thereto; the said sliding bars passing through a mortise in the shank and lying parallel with each other, and one above the other, so that the cutters will work upon the same side of the centre-point. 2d, The recess made in the lower end of the shank, so as to allow the inner cutter to slide close up to the point, and thereby adapt the instrument to cutting very small washers.

40. Faucet; James Powell, Cincinnati, Ohio.

Claim—The elastic annular valve seat and sliding collar, in the described combination with an adjustable plug valve of hard metal.

41. Construction of Sheet-metal Coffins; Isaac C. Shuler, Amsterdam, New York.

Claim—1st, The construction of a sheet-metal coffin in two sections, stiffened with frames or straps, and, in dividing the coffin into two sections, I do not confine myself to any particular locality on the sides for making the joints, but claim forming the joint on the side of the wall at any convenient point between the flanch and the rim, and concealing the same with an adjustable moulding. 2d, The frames for stiffening the coffin, and also the scrolled rim or joint.

42. Stoves; David G. Stafford, Syracuse, New York.

Claim—The combination of a self-regulating valve applied to the smoke-pipe of coal stoves, and operating as set forth, with an air-flue surrounding the fire-box, as described.

43. Grates; Joseph Tiben, St. Louis, Missouri.

Claim—Arranging the adjustable furnace back in the furnace place, and constructing the same as set forth.

44. Joiner's Clamp; William S. Todd, Mechanicsville, Iowa.

Claim—The combination of the adjustable lever with the frame and sliding block, arranged in the manner set forth.

45. Construction of Cane Juice Boxes; Louis Tregre, Parish of St. John the Baptist, Louisiana.

Claim—The method of separating the pure from the impure parts of the juice, when the latter has settled to the bottom of the box, so that the pure parts can be drawn off without disturbing the impure, by dividing

the one from the other by means of a movable partition valve, or its equivalent, arranged within the box, as described.

46. Hot Air Register; E. A. Tuttle, Brooklyn, New York.

Claim—The arrangement and combination with the leaves of the roller, having its axis movable and traveling on a shelf, with or without springs, as described.

47. Mode of Operating the Fingers of Printing Presses; Stephen D. Tucker, Assignor to R. M., R., and P. S. Hoe, City of New York.

Claim—Operating the finger-shaft by means of a grooved disc attached thereto, and the roller attached to a plate or proper support, so as to be respectively within and without the path of rotation of the finger-shaft.

48. Printing Presses; Lemuel T. Wells, Cincinnati, Ohio.

Claim—In the described combination with stationary buttments on the ways, I claim the attachment to the bed of a closed cylinder, its piston having a stroke relatively less than that of the bed, and acting to simultaneously condense and rarify the air at alternately opposite ends of the cylinder, as set forth.

49. Opening Valves to Extinguish Fire; S. H. Wilder, Grinnell, Iowa.

Claim—The arrangement of a reservoir, or other means of producing pressure, combined with a system of tubes, cross tubes, and valve shafts, with valves and stop-cocks, arranged as described, when used as a means of operating upon a cylinder and piston, or a water wheel, for the purpose of starting and afterwards stopping the wheel or engine without the intervention of any person than the one who discovers the fire. Also, the use of gear wheels, rack bar, and blank wheel, or their equivalents, arranged to move the gate of a water wheel out and in alternately by a repetition of the same motion.

50. Apparatus for Watering and Sweeping Railways; Wm. C. Allison, Assignor to self and John Murphy, Philadelphia, Pennsylvania.

Claim—1st, The horizontal perforated pipe and the swing pipes, in combination with a truck having wheels adapted to the rails of a passenger railway, the said truck carrying a tank, and the said swing pipes being arranged and operatad by the devices described, or their equivalents. 2d, The combination of the adjustable revolving brushes with the truck, arranged in respect to the rails, as specified. 3d, In combination with the brushes, any convenient number of projections, revolving simultaneously with the said brushes, and so arranged in respect to the rails as to clean the grooves or corners of the treads from all obstructions.

51. Feed-water Apparatus for Steam Boilers; Wm. Barnes, Assignor to Philo B. Stewart, Troy, N. York.

Claim—1st, In combination with a steam boiler and a close chamber, placed higher than, or at the same height as, the steam boiler, and having communication therewith by a steam passage and a water passage, each provided with a stop-cock or valve, a close receiver located lower than the boiler, and having a steam passage from the boiler and a water passage into the chamber for use in raising water from a place lower than, and introducing it into, the boiler while the boiler is charged with steam. 2d, In combination with the matter above claimed, making the receiver in two parts, with the steam pipe from the boiler and the cold water supply pipe, both entering one part, and the hot water supply pipe entering, and a water pipe to the chamber, leaving the other part, and with the two parts of the receiver connected together by a passage, as set forth.

52. Mode of Applying Power to Machinery; Delectus Durfey, Fort Seneca, Assignor to self, L. A. Lyon, and H. P. Tyler, Clarksfield, Ohio.

Claim—The combination of the treadle levers, arms, and springs, with the grooved wheel and spring braces, operating as described.

53. Compound Illuminating Fluid; N. A. Dyer, Medford, and J. F. Augustus, Boston, Mass., Assignors to Joseph C. Tucker, Brookline, New Hampshire.

Claim—The combination of ingredients, for the purpose set forth, and essentially in the proportions described.

54. Printing Presses for Addressing Newspapers, &c.; George Henderson, Assignor to self and George Hutchison, Alleghany, Pennsylvania.

Claim—1st, The combination and arrangement of the guide table and pulley, the press-wheel, the conveying pulley, and inking rollers, with type frame and the open hopper, arranged in the manner specified. 2d, The use of the open hopper, constructed as described. 3d, The use of the pins, or their equivalent, on the type frame, for the purpose of carrying forward the papers.

55. Watches; Charles E. Jacot, Assignor to Saltzman, Jacot & Co., City of New York.

Claim—1st, Constructing the bridge or plate with the curve and index, for the purposes specified. 2d, Constructing the bridge plate separately from, but screwed to, the three-quarter plate, for giving access to the centre, second, and third wheels, without removing said three-quarter plate. 3d, Attaching the three-quarter plate to the dial plate, by riveting the columns to the plate and inserting the screws at the dial plate, for the purposes set forth. 4th, Constructing the click spring, as specified, for preventing the ratchet teeth being broken.

56. Stoves; John Martino, Assignor to D. Stuart and Richard Peterson, Philadelphia, Pennsylvania.

Claim—The division plate, L, with its damper, the plate, k, with its openings, and the casing with its wings, arranged in respect to each other and to the outer casing and fire-pot, as set forth.

57. Forcing Pump; Robert Poole, Assignor to self and German H. Hunt, Baltimore, Maryland.

Claim—Enlarging the areas of the inlet and exit openings, where they connect with the pump cylinders, by means of the swells, in the manner set forth.

58. Pistons of Pumps; Robert Poole, Assignor to self and German H. Hunt, Baltimore, Maryland.

Claim—A valve made of flexible material hung loosely upon the piston rod, and having for its bearings the round edged wings of the nut by which it is fastened to the piston, in the manner described. Also, in combination with a flexible valve and winged screw-nut, a piston constructed of ribs, which presents sharp edges to the water while they are flat at the end, which constitutes the seat of the flexible valve, in the manner described.

59. Automatic Fan; John B. Powell, Assignor to self and G. B. Frick, Philadelphia, Pennsylvania.

Claim—The spindle, with any convenient number of cog-wheels of different sizes, in combination with a similar number of cog-wheels, also of different sizes, on the crank spindle, when the said spindle and its wheels are rendered adjustable, and are applied to, and combined with, the work of the automatic fan.

60. Tin-folding Machines; Charles H. Raymond, Assignor to the Pecksmith Manufacturing Co., Southington, Connecticut.

Claim—The arrangement of the clamp with bed-piece and folder, when combined with revolving gauge, so that the width of the crimp or fold may be first gauged, and then that portion of the tin contiguous to the part intended to be folded be first firmly clamped and held fast, and then the fold or crimp formed thereon, in the manner described, all by one simple movement of folder, and parts in connexion, and without marring the tin.

61. Harvesting Machines; G. W. Richardson and Robert Glover, Assignors to selves, J. B. Williams, and W. A. Horrell, Grayville, Illinois.

Claim—The cams, cast in sections of one or more, and secured to the driving wheel by means of a bolt or screw and flanch, in the manner described.

62. Machines for Breaking Stones for Turnpike Roads, &c.; Ives Scoville, Assignor to self and W. H. Scoville, Chicago, Illinois.

Claim—The arrangement of the funnel-shaped hopper, constructed as described, with the two vertical cylinders, as described, for the purpose of breaking stones for ballasting railroads and Macadamizing streets, turnpikes, &c.

63. Gas Burners; Daniel H. Solliday, Philadelphia, Pennsylvania, Assignor to Edward H. Ashcroft, Boston, Massachusetts.

Claim—The application of the conical or chambered burner to the main burner, in manner set forth.

64. Machine for Making Paper-boxes; Silas B. Terry, Assignor to Silas B. Terry, Jr., Terrysville, Conn.

Claim—1st, The pressure roller, in connexion with the rotating clamp formed of the head and disc, arranged as set forth. 2d, In combination with the pressure roller, head, and disc, the ring or band provided with the pins or stripes, the socket provided with the screws or pins, and the guide plate, arranged as described. 3d, The arrangement of the pressure lever and sliding mandrels, for the purpose specified. 4th, The employment or use of the folding device formed of the plate provided with the ledge, and the pivoted bar, when said folding device is used in connexion with the pressure roller, rotating head, and disc.

65. Skeleton Skirts; Joseph Wesley, Assignor to Joseph B. Wesley, Providence, Rhode Island.

Claim—A skirt having its hoops supported by tapes or straps, which are rendered adhesive by the application of caoutchouc or gutta percha, in the manner described.

SEPTEMBER 13.

66. Saddle-trees; Henry Adams, City of New York.

Claim—A tree for side or ladies' saddles, constructed by connecting the bars by a bridge at the point specified, and with an open space between the front ends of the bars, at their junction with the horns.

67. Rails for Railroads; George S. Avery, Cross River, New York.

Claim—An improvement in railroad iron bars or rails by an offset or bend, made in one end of the rails, and the lapping on of the other end of the rails, and inserting a key between them at the lap, and riveting or bolting them together.

68. Ditching Ploughs; O. S. Bartlett, Romulus, New York.

Claim—The combination of the arms, brace, rods, and blocks, as set forth. Also, the mode of attaching and adjusting the shares by means of the packing blocks, in combination with the bolts and arms, in the manner specified.

69. Straw-cutters; A. F. Blunk, Indianapolis, Indiana.

Claim—A straw-cutter, constructed with angular knives, arms, wheel, feed rollers, slides, springs, band, pulleys, and endless belt, arranged to operate as described.

70. Window-sash Fasteners; E. K. Breckenridge, West Meriden, Connecticut.

Claim—The employment or use of two cams, placed on a common arbor, with a spring applied to them and a lever fitted within a frame, and arranged to operate as set forth.

71. Seed Planters; Z. B. Brown and M. C. Godard, Granby, Connecticut.

Claim—The arrangement and combination of the carrier and stamping wheels, cams and marker device, upon the wheel, the reciprocal levers, seed slides or valves, hoppers, drill formers, and covering shares, in the manner described.

72. Sewing Machines; J. S. Buell, Buffalo, New York.

Claim—1st, In combination with the stationary corrugated surface, the corrugated foot-piece, constructed as set forth. 2d, In combination with the needle or its thread, the conical spool and guide, for causing the slack in the thread to form the loop, and holding said loop from turning until seized by the looper.

73. Seed Drills; Stephen Burrows, Lima, Wisconsin.

Claim—The employment of a grooved ring fitted on the axle or shaft of a seed drill, in combination with the peculiarly constructed tube, leading from the hopper into the groove of the ring.

74. Churn; William Campbell, Waterloo, Pennsylvania.

Claim—The perforated and hinged floats, as an improvement in the construction of dasher-heads for churns.

75. Extracts of Fruit; Rosanna Carpenter, Medford, Massachusetts.

Claim—The described extract of fruit, prepared in the manner specified.

76. Hand-mills for Grinding Apples, &c.; R. P. Clark, Johnstown, New York.

Claim—The described improved hand-mill for household use, in reducing apples, potatoes, and other fruits and roots to pomice—the teeth of the combined cylinder and adjustable yielding concave being formed and arranged in the particular manner set forth.

77. Fastening for Shirt Studs; Barnes Clayton, Philadelphia, Pennsylvania.

Claim—The hollow sliding case and spring, in combination with the tie or post and the bar, arranged to operate together in the manner set forth.

78. Wire Fences; P. S. Clinger, Conestoga Centre, Pennsylvania.

Claim—The combination of the pin with the ratchet in connexion with the mortised posts and the hooked wires, arranged as described.

79. Cotton Seed Planters; T. T. and H. W. S. Collier, Lavernia Texas.

Claim—The arrangement and combination of the distributor and the stirrer, constructed as described, to operate in combination with the packing wheel.

80. Sights for Fire Arms; Henry W. Colvin, Pendleton County, Kentucky.

Claim—The semi-circular form of the fore-sight with its range-piece or bead and shades, and triangular form of the hind-sight with its needle or range and shades, substantially as described, and for the purpose set forth.

81. Rotary Harrows; George Cook, Paris, Illinois.

Claim—The arrangement of the teeth, placed eccentrically on triangular frames which rotate on oblique pivots, as specified.

82. Coffee-pots; Solomon Crowell, Jr., Palmyra, New York.

Claim—The combination of the perforated diffusing chamber, having a tight conical bottom, with the concentric perforated digester, whereby the coffee is exposed in a thin layer of nearly uniform thickness, to the water percolating nearly uniformly through all parts.

83. Brakes for Railroad Cars; Henry Davis, Baltimore, Maryland.

Claim—Increasing the frictional action of the car brakes upon the peripheries of car wheels, by the introduction of sand, or its equivalent, between the frictional surfaces, at the time that the brakes are brought in contact with the car wheels.

84. Piano-forte Actions; David Decker, City of New York.

Claim—1st, Attaching the relieving jacks and regulating screw directly to the key, or to some part carried by the key, so that the repeating lever shall govern the action of the relieving jack, by or through the said regulating screw, whether constructed in this precise manner or in an equivalent. 2d, The groove, in combination with the tongue, pin, or equivalent, for the purpose of keeping the lifting-jack in its proper position in relation to the repeating lever, and for preventing any binding or sticking of said repeating lever and lifting-jack. 3d, So arranging the adjustable piece and repeating lever, both or either of them, so that their regulating screws, both or either of them, shall be at or near the end next toward the front of the key, in front of the hammer rail, for the purpose of being thus conveniently placed for regulating.

85. Prison Lock; Sylvanus A. Denio, Boston, Massachusetts.

Claim—The lock or part, b, with its parts, c e i and k, arranged with each other, as described, to move, hold, and lock the bolt, k, in door, l, when combined, positioned, and secured with lock, h, which in turn locks the shaft, all by turning a single knob—all the parts being constructed and operated in the peculiar manner described.

86. Heels for Boots and Shoes; Simeon Dodge, Jr., and Benjamin Potter, Jr., Marblehead, Massachusetts.

Claim—A heel having a concave seat and a flat tread, with its rises united by cement.

87. Switch-stand for Railroads; Thomas Dougherty, Macon, Georgia.

Claim—The combination of eccentric with the pin, c, through lever to bar, for the purpose of locking and unlocking the main pin, A, to and from notches, M M M.

88. Faucet; Eugene Duchamp, St. Martinsville, Louisiana.

Claim—The arrangement and combination of the oblique slot, handle, stem, and tube, so that on turning the handle, the stem will rise and fall with a spiral or screw movement, thus insuring ease of operation and tightness of packing.

89. Filter; Eugene Duchamp, St. Martinsville, Louisiana.

Claim—The employment of fine spun glass, arranged in the manner set forth, in combination with the reservoir, floating valve chamber, and pure water chamber.

90. Apparatus for Heating Water; Eugene Duchamp, St. Martinsville, Louisiana.

Claim—The combination and arrangement with the false bottom and tank, of the perforated casing, fire chamber, draft-pipe, and smoke-pipe, as described.

[This invention consists in placing within a cylinder or outer casing, perforated at the top and bottom, a smaller cylinder, which latter serves as a fire chamber: these are placed in the centre of a tub having a false bottom, so that when the water, clothes, and soap are put around the boiler in the tub, and a fire made in the inner chamber, a constant rotary current of the water in the tub will be obtained, and the dirt carried to the bottom of the tub.]

91. Mop-head; John Fasig, West Salem, Ohio.

Claim—The construction of a mop-head, consisting of the piece with the slot and hole, in combination with the rod and notches, screw and nut, arranged as set forth.

92. Harness; Jacob Fassnacht, New Milltown, Pennsylvania.

Claim—The device of combining the hip-strap and breech band in one continuous piece for each half, united at B B to form the breeching.

93. Hydraulic Oil Presses; William R. Fee, Cincinnati, Ohio.

Claim—1st, The peculiar construction of the dies and followers, having the grooves and conduits, and also the oil passages, to facilitate the expression of oil. 2d, The solid truss, when made a part of the press, and worked by means of the rack and pinion. 3d, The hinged hoop for charging the press.

94. Cultivators; J. H. Frampton, Hopewell, Ohio.

Claim—The adjustable share standards attached to the parallel adjustable bars, D D, which are secured to the beam by the bars, E E', arranged as set forth.

95. Churn Dash; Daniel K. France, Congress, Ohio.

Claim—The metallic strips attached to the convex surface of the slats, by slots and screws, and operating in the manner set forth.

96. Churn; C. L. Gilpatrick, Saco, Maine.

Claim—The combination of the crank-shafts and staffs with the top, when said top is provided with boxes, in which play slides through which the staffs pass.

MECHANICS, PHYSICS, AND CHEMISTRY.

*On Embroidery by Machinery.** By George Wallis.

(Continued from page 277.)

Discussion.—Mr. Frederick Lawrence inquired whether different colored silks or threads were worked in the machine at the same time.

Mr. Wallis replied that in producing chintz effects, as many colors as might be necessary could be used in different needles, but in getting the shaded effects, as shown in some of the examples, the "trick," for such it really was, of shading the silk in dyeing from light to dark had to be adopted; and thus a certain variety of effect was produced, although this was not always of a very artistic character.

Mr. William Hawes said, looking at this paper, not with the eye of a manufacturer, because he had no knowledge to enable him to form an opinion upon the subject, but as being very interesting in a social point of view, he would offer a few remarks upon one or two matters connected with the subject. The first point which struck him, was that this invention afforded employment to women. It was that peculiar kind of occupation which, whilst stimulating the taste, was capable of becoming a domestic manufacture, and was, therefore, of the greatest benefit to that class which stood most in need of employment. This machine appeared to effect the important end of the economical working of a costly material; for they understood from Mr. Wallis that they could measure, almost to the fractional part of an ounce, the quantity of silk necessary to produce a certain amount of embroidery; and, when that fact was known, all temptation to fraud on the part of the work-people ceased; whereas, in times past, when the silk machines were employed in the houses of the workers, they became a source of constant collision between the employers and the employed, in accounting for the material entrusted to them for the purposes of manufacture. If this machine was capable of doing certain descriptions of embroidery, as well as, or better than, hand labor, and employed persons for whom employment was required, and, at the same time, allowed the manufacturer to entrust a valuable commodity in the hands of the work-people, without fear of fraud—on all those grounds it must be regarded as a valuable addition to our mechanical resources. They had been told that the machine was not, in all cases, capable of producing such perfect results as were obtained by hand labor; but they were likewise told that for some descriptions of goods it produced a better and cheaper article than hand labor could supply. These were points which he thought were especially deserving the attention of the Society; and he considered that they were very much indebted to Mr. Wallis for the clear manner in which he had put before them the benefits which manufacturers and the public might derive from machines of this kind.

Mr. David Chadwick said, although not connected with this branch

* From the Jour. of the Society of Arts, No. 333.

of manufacture, he wished to call the attention of Mr. Wallis to an omission in his paper. He did not hear that any mention was made of a gentleman in Lancashire who had devoted a great deal of attention to embroidery—Mr. Gilbert French, of Bolton. He had visited the works of that gentleman, and had noticed the large number of females who were employed upon this beautiful work, and he had seen specimens of embroidery which, to his eye, were more beautiful and elaborate than those exhibited that evening. Although, as a Manchester man, he felt proud of the honorable mention that had been made of Mr. Houldsworth, yet he thought it would have been well if Mr. Wallis had brought forward some specimens of hand labor in this branch of art, produced by first-class workers of the present day, so as to compare them with the best productions of machine embroidery. As one of the public he thought Mr. Wallis's paper was somewhat defective in some portion of its statistics. He had given them minute particulars of the process by which the work was effected, but he had not given any comparison of the cost of producing these beautiful articles by machinery as compared with that of hand labor. To the public generally it was a matter of little importance by what means a particular article was produced; they were only interested in the economy of the production. Those who purchased these fabrics were astonished at the price at which beautiful table covers could now be obtained, as compared with the cost of similar articles ten or fifteen years ago. He should be glad to hear from Mr. Wallis, if he was able to furnish it, a comparative statement of the cost of producing these articles by hand labor and by machinery. During his (Mr. Chadwick's) visit to Mr. French's establishment, he was informed that that gentleman supplied hand-worked patterns of embroidery of the most costly description, not only to every part of England, but almost to every part of Europe, and that he found, notwithstanding the increasing production of machinery, the demand for hand embroidery work had been constantly advancing.

Mr. Wallis said he feared that Mr. Hawes had misunderstood his remarks as to the increase of domestic employment occasioned by the stimulated production of embroidery in 1847-8. The machines could never be brought into use in the houses of the workers like the sewing machines, as they were of too cumbrous and costly a character. All that was meant in this direction was to call attention to the fact that the demand for hand labor was increased by the action of the machines in cheapening production and thus stimulating demand.

Mr. Hawes said he had merely quoted from the paper itself, which stated, "so far from interfering with the hand labor, it is a fact that, in 1849, there were in London alone some 2000 persons obtaining their living from embroidery who had never done so before, and in Scotland and the north of Ireland some thousands of females were employed in this industry, not in large factories, but in their own houses."

Mr. Wallis continued—With respect to Mr. D. Chadwick's remarks, it happened that Mr. Chadwick was a statist, and he (Mr. Wal-

lis) an artist; both studied figures, but they were of a different kind. He had great respect for figures in arithmetic, and no doubt it would have added to any value there might be in his paper if some comparative statement could have been made as to the cost of production in certain classes of work by machine and hand embroidery. It happened, however, that one or two articles would be no test whatever for any other article, as each would have to be judged of by the quantity of work in each under the precise conditions of its production, for, as shown in the paper, economy in machine embroidery depended upon the greatest use of the needles, and adaptation of the pattern to length of thread, &c. With respect to the excellent productions of Mr. Gilbert French, of Bolton, he (Mr. Wallis) thought he had carefully guarded himself from misapprehension when he stated that his subject was commercial and not artistic embroidery; besides, he had illustrated by a reference to certain examples, the fact that the machine could not produce large and massive patterns of an exceptional character with the same economy as small repeats; nor did he believe that, on the whole, the larger works would possess the artistic qualities of good hand embroidery. His object had not been comparison, but a simple statement of what the embroidery machines could do.

Mr. G. F. Wilson, F. R. S., said there was one point of great interest mentioned in the paper, which had a particular bearing upon the matter which they were all so anxiously discussing—namely, the great Exhibition of 1851. It had been shown that this machine had been first brought out at the national exposition of products at Paris, which was another fact added to the many that had already appeared in the *Journal* of the Society in connexion with exhibitions.

The Chairman remarked that it would be clear to all present that when Mr. Wallis undertook to read this paper, he entered upon a difficulty. When he (the Chairman) first heard the announcement of this paper, he could not conceive how Mr. Wallis could make them comprehend the subject without a machine to illustrate it. But they must all admit that he had explained it well, and that they now really understood how embroidery by machine was accomplished. With regard to the statistics of economy by this process, which had been asked for by Mr. Chadwick, they would understand that in a certain class of goods the economy was twenty times as great as in others. Some of these machines would carry 100 of these needles in one length, and work two frames at the same time—working 200 needles in a simultaneous operation. It appeared that a machine of this description required the attendance of one person to work the pantagraph point, four girls to move the frame, and three others to thread the needles. Thus, they had 200 needles at work with the labor of 8 persons, which made a proportion of 25 needles to 1. In some cases there would be no economy at all in the use of the machines; but it was in such articles as table covers and embroidered cloths that the economy of the machines was most apparent. In the embroidery of one of the table covers exhibited, they would probably have two rows of 96 needles each at work, and from the length of the frame they could work two covers at once;

and, at the same time, the manufacturer had the satisfaction of knowing that he could not be robbed of his silk, as they could calculate almost to a drachm what quantity of silk was consumed in working a particular pattern. Mr. Wallis did not go quite far enough back in his history of the use of these machines. He (the Chairman) remembered that about the year 1834, Mr. Schwabe undertook a very large contract from a city house for embroidered merino dresses; he believed that was the occasion of the first introduction of machine embroidery for ladies' dresses. He might observe that since sewing machines were introduced they had heard very little about distressed needlewomen, and it was evident that the introduction of the embroidery machine had greatly increased the demand for that branch of labor. Machine labor and hand labor acted and re-acted upon each other, the one creating a demand for the other. He had now to propose that which he was sure would be passed with acclamation, namely, a vote of thanks to Mr. Wallis for his interesting paper.

The vote of thanks having been passed,

Mr. Wallis briefly acknowledged the compliment.

The paper was illustrated by a large number of fine specimens of machine embroidery, lent by Messrs. Houldsworth & Co., of Manchester, as well as by several working diagrams prepared by Mr. Wallis. Messrs. Wilson and Newton exhibited their Boudoir Sewing Machine.

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*Heat-conducting Power of Alloys.**†

(Continued from page 190.)

In the *Mining Journal* of last week we gave so much of the paper by Messrs. Crace-Calvert and Richard Johnson as related to the conducting power of pure metals, and now purpose giving a sketch of the remaining portion of the paper, to which, from its elaborate character, it is impossible to do full justice. With respect to the influence of small amounts of impurities on the conducting powers of metals, they thought it would be useful to ascertain the influence which 1 per cent. of a metal exercises when added to another, and these are the curious results obtained with gold and silver:—The conducting power of pure gold was found to be 981, taking silver at 1000, whilst gold with 1 per cent. of silver was only 840. Therefore the addition of 1 per cent. of silver, the best conductor, to gold diminishes its conducting power nearly 20 per cent.

They also examined the influence of carbon on the conductibility of iron, and they found the difference to be about 18 per cent.; thus malleable iron is 436; steel, 397; and cast iron, 359. The influence of a non-metallic substance on a metal is confirmed by the results obtained. Cast copper is represented by 811; with 1 per cent. of arsenic, 570; with 0·5 per cent. of arsenic, 669; and with 0·25 per

*From the London Mining Journal, No. 1232.

†For the information of our non-chemical readers—Sn means tin; Pb, lead; Sb, antimony; Bi, bismuth; Cu, copper; Zn, zinc. Sn 3Cu means 1 part of tin combined with 3 parts of copper, and so on.

cent. of arsenic, 771. The conduction of heat by alloys may be considered under three general heads—1. Alloys which conduct heat in ratio with the relative equivalents of the metals composing them.—2. Alloys in which there is an excess of equivalents of the worse conducting metal over the number of equivalents of the better conductor, and which present the curious and unexpected rule that they conduct heat as if they did not contain a particle of the better conductor.—3. Alloys composed of the same metals as the last class, but in which the number of equivalents of the better conductor is greater than the number of equivalents of the worse conductor; in this case each alloy has its own arbitrary conducting power; the conductibility of such an alloy gradually increases, and tends towards that of the better conductor of the two metals composing the alloy.

The first class are those which conduct heat in the ratio of the conductibility of the metals composing them. This class is represented by the alloys of tin and lead and tin and zinc:—

TIN AND LEAD.

Formula of the alloys and percentage.				Silver=1000. Found.	Calc.
5 Sn=73·97	+1 Pb=26·03			385	386
4 Sn	69.44	1 Pb	30·56	381	381
3 Sn	63·01	1 Pb	36·99	375	372
2 Sn	53·18	1 Pb	46·82	350	350
1 Sn	36·22	1 Pb	63·78	230	236
1 Sn	22·11	2 Pb	77·89	313	317
1 Sn	15·91	3 Pb	84·09	311	309
1 Sn	12·44	4 Pb	87·56	301	304
1 Sn	10·20	5 Pb	89·80	299	301

TIN AND ZINC.

Formula of the alloys and percentage.				Silver=1000. Found.	Calc.
5 Zn=73·43	+1 Sn=26·57			541	572
4 Zn	68·86	1 Sn	31·14	574	564
3 Zn	62·43	1 Sn	37·57	530	551
2 Zn	53·11	1 Sn	46·89	522	532
1 Zn	35·6	1 Sn	64·39	501	495
1 Zn	21·65	2 Sn	78·35	475	467
1 Zn	15·55	3 Sn	84·45	458	451
1 Zn	12·14	4 Sn	87·86	457	447
1 Zn	9·95	5 Sn	90·05	456	442

The above two series of alloys were the only ones which conducted heat as above stated, and from experiments they believe that the metals composing these alloys are simply mixed, and not combined together.

The study of the class of alloys containing an excess of the worse conducting metal being most interesting, they made many experiments to discover why the presence of one metal completely annihilates the conducting power of the other, especially when the latter is the better conductor of the two. The following statements afford an illustration:—

LEAD AND ANTIMONY.

Formula of the alloys and percentage.				Silver=1000. Found.	Calc.
1 Pb=61·61	+1 Sb=38·39			190	251
1 Pb	47·60	2 Sb	52·40	185	237
1 Pb	34·86	3 Sb	65·14	184	225
1 Pb	28.63	4 Sb	71·37	179	219
1 Pb	24·30	5 Sb	75·70	179	215

ANTIMONY AND BISMUTH.

Formula of the alloys and percentage.				Silver=1000. Found.	Calc.
1 Sb=37·74	+1 Bi=62·26			62	110
1 Sb	23·26	2 Bi	76·74	59	91
1 Sb	16·81	3 Bi	83·19	59	83
1 Sb	13·17	4 Bi	86·83	47	77
1 Sb	10·82	5 Bi	89·18	48	75

It will be perceived that the alloys of lead and antimony conduct heat almost as if the square bars examined were composed of pure antimony, for if lead had influenced the passage of heat through the bars, the conducting power of the alloys would have been much higher.

The most important series of this class of alloys are those composed of tin and copper. The results obtained were :—

COPPER AND TIN.

Formula of the alloys and percentage.				Silver = 1000. Found.	Calc.
Cu = 34·98 +		Sn = 65·02		415	558
Cu	21·21	2 Sn	78·79	431	504
Cu	15·21	3 Sn	84·79	423	481
Cu	11·86	4 Sn	88·14	406	468

COPPER AND TIN.

Formula of the alloys and percentage.				Silver = 1000. Found.	Calc.
Cu = 9·73 + 5		Sn = 90·27		396	459
Sn	38·21	3 Cu	61·79	494	670
Sn	31·73	4 Cu	68·27	155	686
Sn	27·10	5 Cu	72·90	207	705

The results obtained with one part tin and four parts copper were so extraordinary that the bar first prepared was re-melted and cast, from a fear that there might be in the mass some vacant space, or hole, impeding conduction; but as it yielded the same results when submitted to experiment, they decided to make a new bar, weighing most carefully the metals to be used, and also the bar when cast; the loss being only 0·5 per cent., they were satisfied that the bar was sound, and still it gave the same figures as the bar first experimented with, and, therefore, they concluded that an alloy of tin and copper containing 68 per cent. of the latter metal, has a conducting power five times less than it should have according to theory. From the above results, it is highly probable that these alloys of tin and copper, and especially the three last, are definite chemical compounds; for if they were mixtures they would conduct heat in ratio to the equivalents of the metals composing them, and would not each have a peculiar and different conductibility. These views were substantiated by experiments which they have made with square bars, composed of sectional parts of copper and tin. These bars were made by Mr. Dancer, a very skilful optician, and the parts were soldered together with tin solder, in so thin a layer that it did not occupy a space of 0·25 millimetres in the five junctions. The first three bars they employed were of the usual dimensions, and composed of cubes of copper and tin, each 1 cub. cent., arranged in the following order:—Bar No. 1—2 cubes tin, 2 cubes copper, 2 cubes tin; bar No. 2—2 cubes copper, 2 cubes tin, 2 cubes copper; bar No. 3—cubes of tin and copper alternately. These bars conducted heat nearly as the theoretical results indicate, No. 1 giving 541 (silver = 1000), whilst 568 was the theoretical calculation; No. 2 giving 575, 696 being the theoretical number, and No. 3 giving 570 instead of 634. The slight difference being probably due to the tin solder existing between each cube, and to the cubes not being perfect in all their dimensions. They were, however, not prepared for the curious results obtained with a bar composed of two longitudinal bars of tin, soldered to two of copper, and placed in juxtaposition; for although it contained in 100 parts the same weight of tin and copper as the last bar, it conducted heat at quite a different rate; in fact, its conductibility was the same as if the bar had been composed entirely of pure copper, and did not contain half its bulk of tin—this bar (No. 4) gave 829, whilst theoretically it should only have given 634. These interesting results were confirmed by having similar bars made of copper and zinc and copper and lead; the former gave 842,

whilst 731 was calculated; the latter 723, whilst 515 was calculated. They next had a bar (No. 7) made in which there was the same relative weight of tin and copper, but in which the surface of the two metals in contact was only one-half of that in the bar No. 4, and although the results leave some doubt whether the surfaces have an action, the figures are sufficiently different to deserve serious consideration. Although bars 4 and 7 theoretically gave the same results, it was found by experiment that whilst the former gave 829, the latter gave but 757. From their researches they conclude that tin, zinc, and lead exercise a marked action on the conductibility of the copper.

With respect to alloys in which there is an excess of the good conductor, the peculiar properties of the four bronze alloys, Sn 2 Cu, Sn 3 Cu, Sn 4 Cu, and Sn 5 Cu, having already been mentioned, they would have nothing more to add to them if it were not to illustrate the extraordinary influence which tin exercises on the conductibility of copper, and also to show that when there is a great excess of a good conductor in an alloy it overcomes the resistance of the bad conductor, and, in consequence, the conductibility of such alloys increases with the proportion of the good conductor.

TIN AND COPPER.

Formula of the alloys and percentage.				Silver = 1000. Found.	Calc.
Sn = 27·10 +	5 Cu = 72·90			207	705
Sn	15·68	10 Cu	84·32	307	749
Sn	11·03	15 Cu	88·97	402	768
Sn	8·51	20 Cu	91·40	465	778
Sn	6·83	25 Cu	93·17	475	784

BISMUTH AND ANTIMONY.

Formula of the alloys and percentage.				Silver = 1000. Found.	Calc.
Bi = 62·26 +	Sb = 37·74			62	110
Bi	45·21	2 Sb	54·79	76	132
Bi	35·48	3 Sb	64·52	80	145
Bi	29·20	4 Sb	70·80	96	153
Bi	24·81	5 Sb	75·19	108	159

The influence of excess of equivalents of lead is not so striking. The alloys of zinc and copper do not offer the distinctive degrees of conductibility that the alloys of copper and tin or bismuth and antimony present; but this may be due to the conducting powers of copper and zinc being within a few degrees of each other.

ANTIMONY AND LEAD.

Formula of the alloys and percentage.				Silver = 1000. Found.	Calc.
Sb = 38·39 +	2 Pb = 61·61			190	251
Sb	23·68	4 Pb	76·32	204	265
Sb	17·20	6 Pb	82·80	221	271
Sb	13·48	8 Pb	86·52	219	274
Sb	11·08	10 Pb	88·92	230	276

COPPER AND ZINC.

Formula of the alloys and percentage.				Silver = 1000. Found.	Calc.
Cu = 49·32 +	Zn = 50·68			688	718
Cu	32·74	2 Zn	67·26	428	687
Cu	24·64	3 Zn	75·36	531	672
Cu	19·57	4 Zn	80·43	589	663
Cu	16·30	5 Zn	83 70	595	657

It is probable that Cu 2 Zn, and Cu 3 Zn are definite compounds, for not only have they a special conducting power of their own far below that of the metals composing them, but also they are perfectly crystallized. The most splendid of all the brass alloys is the alloy Cu Zn, which is of a beautiful gold color, and crystallized in prisms often 3 centims. long. These crystals are also interesting on account of their extraordinary elasticity. It is surprising that so cheap an alloy has not been employed in commerce, for no commercial brass contains more than 30 to 35 per cent. of zinc, whilst the above contains 50·68 of this metal. The only explanation appears to be that

if copper be alloyed with more than 50 per cent. of zinc, the alloys formed do not possess the color of brass, but become white as zinc; and, therefore, manufacturers have never tried to unite these metals in the exact proportions given above. It is remarkable that a variation of a few per cent. in the relative proportions of the two metals no longer yields the beautiful alloy noticed, but only a white and comparatively useless one.

Alloys with an excess of copper gave the following results:—Zn 2 Cu, found 621 (silver=1000), calculated 748; Zn 3 Cu, found 630, calculated 764; Zn 4 Cu, found 666, calculated 770; Zn 5 Cu, found 715, calculated 780. They also thought it useful to analyze the following commercial alloys and determine their respective conducting powers, and the results obtained were—Yellow brass (Cu=64+Zn=56), found 558 (silver=1000), calculated 712; pumps and pipes (Cu=80+Sn=5+Zn=7·5+Pb=7·5), found 426, calculated 707; mud plugs (Cu=80+Sn=10+Zn), found 394, calculated 754; large bearings (Cu=82·05+Sn=12·82+Zn=5·13), found 345, calculated 751. It is extraordinary to find what a low conducting power these alloys possess; for, with the exception of "yellow brass," they do not conduct heat better than wrought and cast iron; this is due to the impurity of the metals employed, and shows the advantage that there will be in substituting for them some of the much cheaper alloys above described. The second part of the paper on "Amalgams" will shortly be published.

Proximate Analysis of Coal Tar. By Mr. Crace Calvert.

From a communication addressed by this gentleman, and read before the Academy of Sciences of Paris, we extract the following account of the constitution of coal tar from different kinds of coals:

	Benzine.	Carbolic acid.	Paraffine.	Naphtaline.	Neutral hydrates of carbon.	Pitch.
Boghead,	12	3	41	0	30	14
Cannel,	9	14	0	15	40	22
Newcastle,	2	5	0	58	12	23
Staffordshire,	5	9	0	22	35	29

Of these substances, he remarks, that the carbolic acid alone possesses any practical amount of antiseptic power. But he finds this substance in so small a proportion as $\frac{1}{1000}$, very valuable as a preservative against offensive putrefactions. He states that the skin of an animal rubbed with carbolic acid on the inside, remained free from vermin for several years.

M. Chevreul reminded the audience that the carbolic acid has also been known under the name of Phenol, Phenic acid, Phenic alcohol, hydrate of phenyle.

For the Journal of the Franklin Institute.

Particulars of the Steamer Champion.

Hull built by Harlan & Hollingsworth & Co., Wilmington, Delaware. Machinery by Allaire Works, New York.—Owner, C. Vanderbilt.—Intended service, Pacific Ocean.

Hull.—

Length on deck, from fore part of stem to after part of stern post, above the spar deck,	242 feet.
" at load line,	235 "
Breadth of beam, molded,	35 "
Frames—apart at centres, 18 and 20 inches—	
" sketch of shape |—depth 4 ins.—width $1\frac{1}{8}$ ins.	
Plates—15 strakes from keel to gunwale.	
" thickness, $\frac{3}{4}$, $\frac{5}{8}$, $\frac{1}{2}$, and 7-16th inches.	
Cross floors—22 ins. high and 8 ins. apart—$\frac{1}{2}$ and 9-16ths inches thick, and capped with angle iron.	
Keel U—depth 7 ins., dimensions 3-16ths.	
Rivets—diameter $\frac{3}{4}$ inches—apart $2\frac{1}{2}$ inches—single and double riveted.	
Depth of hold,	18 " 2 inches.
" to spar deck,	25 " 10 "
Length of engine room,	66 "
Draft of water forward and aft,	10 "
Tonnage, 1490.	
Area of immersed section at load draft of 10 ft., 346 sq. ft.	
Contents of bunkers in tons of coal, 500.	
Masts two—Rig—Foretopsail schooner.	

Engines.—Vertical beam.

Diameter of cylinder,	42 inches.
Length of stroke,	10 feet.
Maximum pressure of steam in pounds, 30.	
Maximum revolutions at above pressure, 20.	
Cut-off—half stroke.	
Weight of engines, 340,000 lbs.	

Boilers.—Two—Return flued.

Length of boilers,	24 feet.
Breadth " { Furnace,	10 " 6 inches.
Breadth " { Shell,	9 " 6 "
Height " exclusive of steam chimney,	9 " 6 "
Weight " with water, 190,000 lbs.	
Number of furnaces, (2 in each.) 4.	
Breadth "	4 " 8 "
Length of grate bars,	7 " 1 "
Number of flues, { above 5. { below 10.	
Internal diameter of flues, { below 2 of 21 ins. & 8 of	13 "
Internal diameter of flues, { above,	1 " $5\frac{1}{2}$ "
Length of flues, { above,	17 " $4\frac{1}{2}$ "
Length of flues, { below,	11 " 10 "
Heating surface, 2491 sq. feet.	
Diameter of smoke pipe,	5 " 7 "
Height " above grates,	56 "
Consumption of coal per hour, one ton.	

Paddle Wheels.—

Diameter over boards,	30 feet.
Length of blades,	6 " 6 inches.
Depth "	18 "
Number " 26.	

Remarks.—One independent steam, fire, and bilge pump—boil-

ers, chimney, and smoke pipe protected from communicating fire, by felt and iron. Three bulkheads; 12 fore and aft keelsons—2 of 42 inches high by $\frac{9}{16}$ths thick, and 10 of 20 inches high by $\frac{9}{16}$ and $\frac{1}{2}$ ins. thick. Stringers on main deck 14 by $\frac{1}{2}$ ins. Deck clamps ∟ 26 by $\frac{5}{8}$ inches; 79 state rooms; 315 steerage berths. Date of trial, September, 1859. C. H. H.

For the Journal of the Franklin Institute.

Particulars of the Steamer R. R. Cuyler.

Hull built by Samuel Sneden. Machinery by Allaire Works, New York. Intended service, New York to Savannah.

Hull.—

Length on deck,		235 feet.
Breadth of beam,		32 "
Floor timbers—at throat *molded* 14 ins., *sided* 10 and 12 ins.		
Frames—*apart at centres* 24 inches,		
" strapped with diagonal and double laid iron straps 4 by $\frac{5}{8}$ inches.		
Depth of hold,		16 " 6 inches.
" to spar deck,		23 " 3 "
Length of engine, boiler, and coal space,		66 "
Draft of water at load line,		18 "
" below pressure and revolutions,		18 "
Area of immersed section at this draft,	548 sq. ft.	
Tonnage, custom house,	1600.	
Contents of bunkers in tons of coal,	150.	
Masts and rig—Foretopsail schooner.		

Engines—Vertical direct.

Diameter of cylinder,		70 inches.
Length of stroke,		4 feet.
Maximum pressure of steam in pounds,	25.	
Cut-off at one half stroke.		
Maximum revolutions per minute,	45.	

Boilers—Two—Horizontal tubular.

Length of boilers,		17 feet 4 inches.
Breadth "		13 " 6 "
Height " exclusive of steam chimney,		13 " 9 "
Number of furnaces,	6.	
Breadth of furnaces,		3 " 11 "
Length of grate bars,		7 " 6 "
Number of tubes,	288.	
Internal diameter of tubes,		4 "
Length of tubes,		14 "
Heating surface, (fire and flues,)	6285 sq. ft.	
Diameter of smoke pipes,		4 " 4 "
Height "		21 "
Description of coal,	Anthracite.	
Draft,	Natural.	
Consumption of coal per hour,	0·71 tons.	

Propeller.—

Diameter of screw,		16 feet.
Length of blades,		4 " $9\frac{1}{2}$ inches.
Pitch of screw,		22 " 6
Number of blades,	4.	

C. H. H.

For the Journal of the Franklin Institute.

Particulars of the Steam Ferry Boats Marion and Gen. Warren.

Hulls built by Rosevelt & Joyce. Machinery by Novelty Iron Works, New York. Intended service, New York to Brooklyn.

Hull.—			
Length on deck, from fore part of stem to after part of stern post, above the spar deck,		142 feet	6 inches.
Breadth of beam at midship section,		33 "	
Floor timbers, at throat—*molded*, 13 ins.—*sided*, $5\frac{1}{2}$ ins.			
Frames—*apart at centres*, 24 ins.			
Depth of hold to spar deck,		12 "	4 "
Length of engine and boiler space,		59 "	
Draft of water at load line,		6 "	
Draft of water at below pressure and revolutions,		6 "	
Area of immersed section at this draft,	170 sq. ft.		
Tonnage, custom house,	521.		
Engine.—Vertical beam.			
Diameter of cylinder,			38 inches.
Length of stroke,		9 feet.	
Maximum pressure of steam in pounds,	25.		
Cut-off, at		4 "	6 "
Maximum revolutions per minute,	28.		
Weight of engines and wheels *in pounds*,	63,700.		
Boiler.—One—Cylinder, with drop return flues.			
Length of boiler,		25 feet.	
Weight " without water, *in pounds*,	31,159.		
Number of furnaces,	2.		
Breadth "		3 "	10 inches.
Length of grate bars,		6 "	10 "
Number of flues,	16.		
Internal diameter of flues,	14 of 14 ins., 2 of 24 ins.		
Length of flues, upper and lower,		13 "	5 "
Length of flues, centre,		11 "	$3\frac{1}{2}$ "
Heating surface (fire and flue),	1198 sq. ft.		
Diameter of smoke pipe,		3 "	4 "
Height " from top of boiler,		40 "	
Description of coal,	Bituminous.		
Draft,	Natural.		
Paddle Wheels.—			
Diameter,		18 feet	6 inches.
Length of blades,		8 "	
Depth "			24 "
Number "	18.		

C. H. H.

Straw Matting.

The Abbè Moigno notices in the *Cosmos* the introduction of a new article, which is a tissue of straw, made of indefinite length, and of any breadth not greater than one metre, ($1\frac{1}{12}$ yards.) It is made by uniting plaits of the straw by thread of preserved hemp or galvanized on tin wires. The fabric is made in a loom, and at the rate of 100 sq. yards per day by a single skilled workman. These mattings are extensively used to protect the vineyards and gardens, and experience seems to show that they form a very valuable improvement.

Cosmos, 1st July, 1858, p. 8.

For the Journal of the Franklin Institute.

Particulars of the Steam Ferry Boats Ethan Allen and Commodore Perry.

Hulls built by Thomas Stack, Williamsburgh. Machinery by Novelty Iron Works, New York. Intended service, New York to Brooklyn.

Hull.—		
Length on deck, from fore part of stem to after part of stern post, above the spar deck,		144 feet 6 inches.
Breadth of beam,		33 "
Floor timbers, at throat—*molded*, 13 ins.—*sided*, 5½ ins.		
Frames—*apart at centres*, 24 inches.		
Depth of hold,		12 "
Length of engine and boiler space,		59 " 6 "
Draft of water at load line,		6 "
" below pressure and revolutions,		6 "
Area of immersed section at this draft,	170 sq. ft.	
Tonnage,	527.	
Engine.—Vertical beam.		
Diameter of cylinder,		38 inches.
Length of stroke,		9 feet.
Cut-off at,		4 " 6 "
Maximum pressure of steam in pounds,	25.	
" revolutions per minute,	28.	
Weight of engines *in pounds*,	63,700.	
Boiler.—One—Drop flued.		
Length of boilers,		25 feet.
Breadth "		9 "
Weight " without water,	31,159 lbs.	
Number of furnaces	2.	
Width "		3 " 10 inches.
Length of grate bars,		6 " 10 "
Number of flues,	16.	
Internal diameter of flues,	14 of 14 ins., 2 of 24 ins.	
Length of flues, upper,		13 " 5 "
Length of flues, lower,		11 " 3½ "
Heating surface,	1198 sq. ft.	
Diameter of smoke pipe,		3 "
Height "		40 "
Description of coal,	Anthracite.	
Draft,	Natural.	
Paddle Wheels.—		
Diameter,		18 feet 6 inches.
Length of blades,		8 "
Depth "		2 "
Number "	18.	

C. H. H.

Persistent Activity of Light.

In former numbers of our *Journal* we have given an account of the extraordinary experiments of M. Niepce de St. Victor, by which it was shown that when a sheet of paper impregnated with certain substances, (*i. e.* tartaric acid,) is exposed to the solar light and then enclosed in a perfectly tight box, a photographic action takes place, by which pictures may be printed as though in the light.

This subject has been farther investigated by M. l'Abbè Laborde,

who is led by his experiments to conclude that the active agent "is an emanation, not a radiation."

The following are two of his experiments:

I. The sensitive paper was partly covered by a glass plate in contact with it; another plate of glass or ivory was placed across the first, so as to oppose the direct radiation from the part which it covered, but not to the circulation of any vapors emanated; when the box was opened, the paper was found evenly blackened throughout, except under the glass in contact with the paper.

II. The box containing the insolated sheet was left for four hours in a warm place. M. Laborde then opened it carefully, and holding the opening downwards, gently withdrew the sheet; then quickly fixing the sensitive paper upon the cork, he re-closed the box and placed it in a cool place. When it was again opened, after twelve hours, the sensitive paper was found blackened, notwithstanding the absence of the insulated sheet.—*Cosmos.*

For the Journal of the Franklin Institute.

Further Performance of the U. S. Steam Sloop "Wyoming."

In the last number of this *Journal* (p. 267), the results of the engineers' trial trip of this ship were given. Since which, the ship having departed on a cruise to the Pacific, the capacity of her machinery was tested in the Delaware Bay, and the result reported from the Breakwater. On this occasion, the coal used was "Broad Top," mined in Pennsylvania, a "semi-bituminous" coal, free from sulphur, emitting no smoke except when freshly fired, and of free burning properties. The draft of the ship was greater than on the previous trial, viz:—

Forward, ...	13 feet 3 inches.
Aft, ...	13 " 4 "

During the passage down the Delaware, the following is the

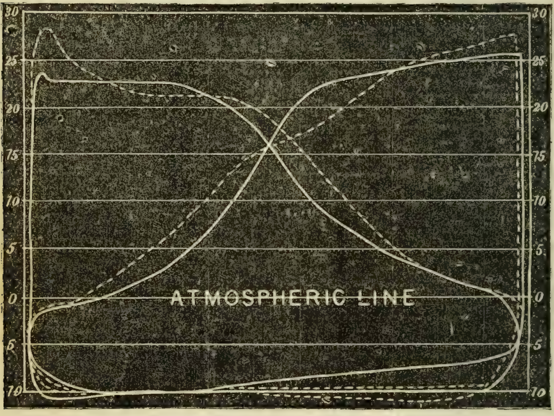
STEAM LOG.

Hour.	Steam pounds.	Vacuum inches.	Throttle open.	Cut-off inches.	Coal pounds.	Revolutions per minute.
9 to 10	27	25·0	·28	Variable from 12·5 to 15·5. Averaging 14 inches.	3136	67·1
11	26	23·0	·40		3584	73·0
12	26	23·0	·40		1792	75·1
1	25	23·5	·40		1000	73·0
2	25·5	23·0	·55		1240	76·1
3	24	23·0	·40		1755	69·0
4	25	23·2	·40		2223	75·3
5	24	23·0	·40		2680	69·2
	25·25	23·34	·39	14·0	1897	72·3

Average H. P. developed in whole time, . 791·54 (calculated.)
" coal per H. P. per hour, in pounds, . 2·40 including spreading fires.
Highest H. P. developed by indicator diagram, 1088·7 at 80½ revolutions.
" number of revolutions per minute, 85.
All the furnaces (14) were in use during this time.

The following diagrams show the performance of the engines at the time the above power was indicated.

Forward Engine. (Full lines.)		*After Engine.* (Dotted lines.)	
Date and hour,	Oct. 5, 1·5 P. M.	Date and hour,	Oct. 5, 1·5 P. M.
Revolutions per minute,	80·5	Revolutions per minute,	80·5
Pressure of steam,	27·0	Pressure of steam,	27·0
Throttle valve,	wide.	Throttle valve,	wide.
Vacuum,	23·5	Vacuum,	23·5
Cut-off,	15 ins.	Cut-off,	16 ins.
Mean pressure,	22·09	Mean pressure,	23·22
Indicated H. P.,	528·88	Indicated H. P.,	559·89



The speed of the ship at the above deep draft (having 266 tons of coal on board at starting), was 10·58 geographical miles per hour, and when the above cards were taken, the log showed a speed of 11·25 knots per hour. The slip of the screw averaged 20·6 per cent.

On the outward trip to Charleston reported in the last number of the *Journal*, the slip was 16 per cent., the ship drawing on an average 13 feet aft, 12 feet forward.

On the homeward trip the slip was 19·1 per cent., the ship drawing on an average 12 feet 8 inches aft, 11 feet 10 inches forward.

It would thus appear that at sea the slip would average in smooth weather and half coal in, about 17 to 18 per cent.

Evaporation of the Boilers.

By reference to the indicator diagram taken during the homeward passage from Charleston (*vide* p. 271), and to that of the after engine at the same time (not published), it appears that, by averaging all

four ends, the actual point of cutting off was 10·2 inches, and the initial pressure of steam entering the cylinders, 15·3 pounds above the atmosphere, of which the volume is 880.

The total clearance and space in ports for each end equals 1·9 inches of stroke.

The volume of steam used, by the diagrams, was therefore $10{\cdot}2+1{\cdot}9=12{\cdot}1$ inches of stroke, or for four ends, $12{\cdot}1\times 4=48{\cdot}4$ inches; and, as the area of each cylinder is 1964 sq. inches, the volume was $1964\times 48{\cdot}4\times 72$ revolutions $=6844104$ cubic inches $=3960$ cubic feet of steam; $\frac{3960}{880}=4{\cdot}50$ cubic feet $\times 62{\cdot}5=281{\cdot}5$ pounds of water per minute.

The coal consumed averaged 2·73 pounds per hour per H. P., or $\frac{2{\cdot}73\times 640{\cdot}8}{60}=29{\cdot}15$ pounds per minute. Hence $\frac{281{\cdot}5}{29{\cdot}15}=9{\cdot}65$ pounds of water evaporated by one pound of fuel.

By the diagrams given above, the mean point of cutting off in all four ends was 13·7 inches; and the mean entering pressure, 22·8 pounds above the atmosphere, of which the volume is 717. Hence $\frac{13{\cdot}7+1{\cdot}9=15{\cdot}6\times 4\times 1964\times 80{\cdot}5}{1728}=5709$ cubic feet of steam per minute; $\frac{5709}{771}=7{\cdot}404\times 62{\cdot}5=462{\cdot}75$ pounds of water per minute.

As this trial was too short to indicate the correct hourly consumption of fuel, the rate per H. P. per hour may be assumed as the same as previously found, viz: 2·73 pounds; and the consumption would then be $\frac{1088{\cdot}7 \text{ H. P.}\times 2{\cdot}73}{60}=49{\cdot}5$ pounds of coal per minute. Therefore $\frac{462{\cdot}75}{49.5}=9{\cdot}32$ pounds of water per pound of fuel, as the rate of evaporation.

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*Gilding Textile Fabrics.**

Gold stuffs are generally manufactured by weaving gold thread, which renders the tissue stiff and heavy. M. Burot has just discovered a method of gilding stuffs by means of electrical agency. The piece to be gilt, whether made of silk or any other material, is dipped into a solution of nitrate of silver and ammonia; after remaining in this solution a couple of hours, the stuff is taken out, and when dry exposed to a current of pure hydrogen gas, which reduces the salt, and leaves the silver in a metallic state on the stuff. A silvered surface is thus obtained, which is easily gilt over by the usual galvanoplastic methods. Beautiful specimens of gilt and silvered lace were exhibited in London some five years since. They were of French origin, but the process was not made known.

*From the Lond. Mechanics' Magazine, January, 1859.

For the Journal of the Franklin Institute.

Remarks on the Aurora of August 28th, 1859.

By Benjamin V. Marsh.

In this, as in other great auroral displays, there were evidently two systems of bodies or appearances situated in planes nearly at right angles to each other.

First. *Horizontal* bands of dense whitish cloud, stretching across the heavens in nearly an east and west direction, in the form of arches.

These were few in number; but the spaces between them were mostly occupied by numerous fragments and narrow irregular streams of the same material, running parallel to the bands—the whole forming a kind of luminous curtain, covering more than three-fourths of the visible heavens, leaving only segments of clear sky near the northern and southern horizons.

Second. *Vertical* "streamers" of great brilliancy and splendor in the form of columns having their bases in the horizontal curtain, and extending up from it to immense heights, and visible *through* the luminous curtain.

A scene changing so frequently and rapidly, was, of course, very unfavorable for accurate measurements, but fortunately the southern margin of the luminous curtain, as seen from Philadelphia and vicinity, remained well defined and nearly stationary for more than three-quarters of an hour, commencing at half past 8 o'clock or earlier, thus affording a good opportunity for determining its position.

As to its elevation above the southern horizon during this interval, I have the following information:—

1. At Newburyport, Mass. Latitude 42° 48½′.

An article signed "*P*," in the *Newburyport Herald* of August 30th, in the course of a careful and detailed account of its progress, says that at 9 o'clock (8¾ Philadelphia time)," Lambda Scorpii marked its southern border."

The altitude of Lambda Scorpii at 9 o'clock at Newburyport was 5¾ degrees; and a great circle passing through this star at that time, and cutting the horizon at the east and west points, crossed the meridian at an altitude of 6 degrees, which must correspond very nearly to the altitude of the highest point of the margin of the curtain above the southern horizon.

2. At New Haven, Conn. Latitude 41° 18′.

Prof. C. S. Lyman and Mr. E. C. Herrick ascertained its minimum elevation between half past 8 and 9 o'clock to be from 10½ to 12 degrees.

3. At Burlington, N. J. Latitude 40° 5′.

Samuel J. Gummere *estimated* its altitude between half past 8 and 9, to be from 18 to 20 degrees, but made *no measurements*.

4. At Philadelphia. Latitude 39° 57′.

Soon after half past 8, Charles J. Allen carefully noted its position between two fixed objects, and afterwards ascertained by actual mea-

surement that this gave an elevation of about $22\frac{1}{2}$ degrees above the southern horizon.

5. At Sandy Spring, Md. Latitude 39° 9′.

Prof. Benjamin Hallowell of Alexandria, says, "the elevation of the southern margin of the luminous curtain above the southern horizon, I thought, and mentioned to those with me, was about the meridian altitude of the equator, say 51 degrees."

Assuming the direction of the southern margin of the curtain to have been due east and west, and calculating its height and position from the above data, I find the following results.—

	HEIGHT IN MILES.	LAT. SOUTH. MARGIN.
Newburyport 6, and New Haven $10\frac{1}{2}$, give,	49·9	38° 0′
" 6, " " $11\frac{1}{4}$, "	41·3	38 $39\frac{1}{2}$
" 6, " " 12, "	35·8	39 6
" 6, " Burlington 18, "	49·3	38 3
" 6, " " 19, "	46·5	38 15
" 6, " " 20, "	44·3	38 $25\frac{1}{2}$
" 6, " Philadelphia $22\frac{1}{2}$, "	43·2	38 31
New Haven $10\frac{1}{2}$, " Burlington 18, "	48·7	38 $4\frac{1}{4}$
" $10\frac{1}{2}$, " " 19, "	43·9	38 $21\frac{1}{4}$
" $10\frac{1}{2}$, " " 20, "	40·4	38 34
" $11\frac{1}{4}$, " " 18, "	59·6	37 39
" $11\frac{1}{4}$, " " 19, "	52·5	38 2
" $11\frac{1}{4}$, " " 20, "	47·5	38 $18\frac{3}{4}$
" 12, " " 18, "	74·2	37 $6\frac{1}{2}$
" 12, " " 19, "	63·5	37 38
" 12, " " 20, "	56·3	38 0
" $10\frac{1}{2}$, " Philadelphia $22\frac{1}{2}$, "	38·9	38 $39\frac{1}{4}$
" $11\frac{1}{4}$, " " $22\frac{1}{2}$, "	44·6	38 28
" 12, " " $22\frac{1}{2}$, "	51·5	38 15
Sandy Spring 51, " Newburyport 6, "	41·1	38 $40\frac{3}{4}$
" 51, " New Haven $11\frac{1}{4}$, "	40·9	38 41
" 51, " Burlington 19, "	32·8	38 $46\frac{1}{2}$
" 51, " Philadelphia $22\frac{1}{2}$, "	36·5	38 44
Average,	47·1	38° $18\frac{1}{4}$′

The above table is intended to exhibit the whole range of results from the preceding data, but the following are, no doubt, the most reliable items.

	HEIGHT IN MILES.	LAT. SOUTH. MARGIN.
Newburyport 6, and New Haven $11\frac{1}{4}$, give,	41·3	38° $39\frac{1}{2}$′
" 6, " Philadelphia $22\frac{1}{2}$, "	43·2	38 31
New Haven $11\frac{1}{4}$, " " $22\frac{1}{2}$, "	44·6	38 28
Average,	43·0	38° 33′

The position of the corona has usually been observed to correspond with that of the pole of the dipping needle (which, at Philadelphia, is about 18 degrees south of the zenith), indicating that the tops of the streamers are inclined southward, at an angle of 18 degrees from a vertical position.

Assuming this to have been true in this instance, and that the streamers had their bases in the curtain at the height of 43 miles, observations made in Cuba, and published in the "*Diario de la Marina*" of August 30th, give us the means of determining their position and length.

At Havana no mention is made of the arch or curtain (which was, doubtless, below the Cuban horizon), but the streamers are described as ascending to the height of the pole star.

At Burlington several streamers were observed issuing from the southern side of the corona, but none approached within 45 degrees of the southern horizon. Therefore their bases, if only about 43 miles high, could not have been south of the 39th parallel of latitude. The entire absence of auroral light below the arch, proves these to have been the *only* streamers south of Burlington in this longitude, and, consequently, that they were probably the *identical* streamers seen in the north by the Cubans.

Supposing, then, that they sprang from the curtain in latitude 39°, and that, as seen from Havana, they had an elevation equal to that of the pole star, I find their length 578 miles, and that their tops were situated nearly in latitude 36° 47′, at a vertical height of 596½ miles.

This would give Norfolk as the most southern point at which the streamers would appear to reach the zenith—the display at all places further south being confined to the northern heavens.

Among the most constant features of the display at Burlington, were two large irregular masses or patches of light, remaining pretty nearly stationary during most of the evening, one in the east, and the other about 15 degrees north of west, each at an elevation of from 10 to 20 degrees above the horizon, varying greatly in color and brightness, but evidently sympathizing with each other in all their changes.

The east and west bands seemed to terminate in these masses which were evidently the places of convergence of the parallel streams composing the curtain, but their brilliancy and the variety of their colors were far too great to be due to these whitish streams alone.

Prof. B. Hallowell, of Alexandria, says, "There appeared to be two foci of auroral light maintaining pretty nearly a constant position the greater part of the evening, but varying materially in color at different times, and also in the number and brightness of the streamers issuing from them. We thought one of them was a little north of west, and the other a little south of east. I should judge the centre of each to have been about 10 degrees above the horizon."

The *Steubenville Ohio Journal*, of August 30th, speaks of "the two centres in the north-east and the north-west, with a fitful gleam between them."

In England the lights in the north-east and south-west, particularly the latter, attracted general attention, and were, in some instances, supposed to arise from a great conflagration ; and various accounts in this country refer to the luminous clouds in the east and west; from all which it is evident that the phenomenon was not local but general.

At Burlington, during a considerable time (probably thirty minutes

and perhaps much longer), preceding half past 9, a segment 10 or 15 degrees in height over the northern horizon, was perfectly free from the aurora, showing the limit of the curtain in that direction. This margin, however, was neither so regular nor so well defined as the southern.

The correspondent "*P*," of the *Newburyport Herald*, already quoted, says, "At a quarter before 10" ($9\frac{1}{2}$ Philadelphia time), "the northern border of a luminous arch passing from east to west, was marked by Nu in the right foot of the Swan, while the whole southern and south-western heavens were glowing with streamers rushing to the elevated pole of the magnetic dip, *the whole northern heavens being entirely destitute of auroral light.*"

Since Nu Cygni was then nearly in the zenith, it appears from the above that, previous to half past 9, Philadelphia time, the northern border of the curtain was vertical over Newburyport. Consequently the total width of the curtain at this time, must have been only four and a half degrees of latitude, or about 315 miles.

In England the prevalence of clouds interfered with complete observations, but from the *London Times* we learn that Mr. Lowe noted a splendid display at half past 2 (corresponding with half past 9, Philadelphia time, its period of maximum brilliancy in this country, and thus proving the phenomena to be identical), and that an observer at Brighton saw a band stretching from south-west to north-east by east.

At Stockton, California, the *San Joaquin Republican* of August 31st, says, "It appeared about 9 o'clock as a faint white light commencing about north and extending to about east by north. In about 10 minutes later great streams of red and blue shot up all along the north-eastern horizon, but they appeared to shoot up highest about midway of the light."

A consideration of all the preceding statements seems to justify the conclusion that the luminous horizontal curtain was in the form of a ring, the centre of which was probably situated in or near the northern part of Davis' Straits—its direction having been shown to be nearly north-west from England, a few degrees east of north from Philadelphia, and north-east from California—that this ring was about 43 miles from the earth, and that its width, previous to half past 9 o'clock, was about 315 miles; and furthermore, that from various points on its surface, arose splendidly illuminated vertical columns several miles in diameter, and near 600 miles high, and that these columns were at all times at very considerable distances from each other—one streamer for every five hundred square miles being more than sufficient to satisfy all observations.

We have, therefore, overlying the annular curtain, an annular stratum or zone 550 miles in thickness, composed entirely of vertical streamers, the whole forming a thick ring having the curtain for its lower boundary; and I think it is to these vertical streamers that we must look for the cause of the fixed masses of light in the east and west.

It will be recollected that these were conspicuous during nearly the whole evening, although the display of streamers was, during a great part of the time, quite limited. Now, an observer at Philadelphia in looking north, looks across the ring and through a comparatively moderate thickness of streamers, even when viewing a point as much as 45 degrees above the horizon; but, in looking east or west, he looks through the same lengthwise, and consequently through a very great thickness of the streamer-bearing zone.

The result is, that in the north he sees an occasional streamer comparatively near to him, and therefore distinctly defined, while towards the eastern horizon the light of a great many very distant streamers is so completely blended as to give the effect of a diffused and steady brightness.

Had the curtain with its overlying stratum of streamers extended indefinitely east and west, the brightness would probably have been about the same at the horizon (except so far as affected by the want of perfect transparency in the atmosphere), as at 10 or 20 degrees above it, the greater distance of the streamers from the eye being counterbalanced by their greater number. But, in this instance, the curtain being in the form of a ring of comparatively small diameter, its curvature carried it greatly to the northward before the whole thickness reached the horizon—the southern margin of the upper surface of the ring only reaching the horizon when as far north as the centre of the fixed light. Consequently, south of this point the depth of streamers looked through at the horizon, must diminsh rapidly (without a corresponding diminution at greater elevations), and the light speedily vanish.

This corresponds with the phenomena as observed, and we may therefore conclude that these "foci" in the east and west, although coinciding in position with the places of convergence of the horizontal streamers, derive their color and brilliancy chiefly from vertical streamers, and that if the streamer-bearing curtain had extended indefinitely northward, we should have observed the same phenomena in that direction also.

It should be remarked, that if the centre of the ring had the place I have assigned it, some changes must be made in my calculations for determining the height, which will tend slightly to increase it.

The sudden projection of the streamers to such vast heights from the curtain, seems to bear a striking analogy to the formation of the tails of comets, and suggests the inquiry whether they are not, in like manner, the effect of a repulsive force.

Philadelphia, October 18th, 1859.

On the Freezing Point of Water in Capillary Tubes.

Many years ago M. Donnè showed that water enclosed in narrow tubes of a substance capable of being wetted by it, might be raised to a temperature considerably above 212° without boiling—and these experiments have been made the basis of several attempts to account for the

explosions of steam boilers. Mr. H. C. Sorby, in a note communicated to the London, Edinburgh, and Dublin Philosophical Magazine, completes these researches by showing that in capillary tubes, the temperature of water may be lowered far below 32° without freezing even when the tubes are shaken. In tubes of from $\frac{1}{200}$ or $\frac{1}{300}$ inches in diameter, the water may be reduced to 5° Fah., without freezing, provided it be not in contact with ice. These experiments go to show that these phenomena are caused by the adhesion of the water to the walls of the tube interfering with its change of state; and thus lead to the belief that they have no application to water in large vessels, such as steam boilers.

New Disinfecting Powder.

MM. Corne and Demeaux propose as a powerful disinfectant, a mixture of powdered plaster of Paris, with two or three per cent. of coal tar. M. Velpeau, the celebrated surgeon, and director of the Hospital *La Charité*, speaks of it in the most energetic terms as perfectly successful in disinfecting the most offensive ulcers, (to which it is applied as a plaster,) and assisted their healing; and in rendering entirely inodorous the masses of semi-putrescent matters in the dissecting room. So highly did he think of its value, that he urged the Academy of Sciences to waive their usual rule of awaiting the report of their Committee, and to recommend the Minister of War at once to use it for the wounded in the late Italian war.—*Cosmos*, July 22, 1859, p. 106.

New Material for Buttons.

Excellent buttons and even handsome cameos may be made with talc or steatite, provided after they are made they be heated for several hours at a nearly white heat. By this strong calcination, the steatite gets so hard that it strikes fire with flint, and resists the best tempered file. They may be polished by emery, tripoli, and jeweler's putty; and colored by mineral or organic matters; chloride of gold colors them purple; nitrate of silver, black; exposure to the reducing flame increases very much the brilliancy of the color.

Cosmos, July 22, 1859, p. 92.

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*Coal Supply of Great Britain.**

The coal fields of Great Britain yield nearly 70,000,000 tons per year. A better idea of the immense commerce of England could not be formed than by stating the fact that at Manchester and its environs a motive steam power equal to 1,200,000 horses is constantly maintained, to support which there are consumed 30,000 tons of coal per day, or 9,500,000 a year. In the manufacture of salt alone, about

*From the Lond. Practical Mechanics' Magazine, April, 1859.

3000 tons are consumed per day, or 950,000 a year. The Transatlantic steamers from Liverpool and other ports consume 700,000 tons per year, and the manufacture of gas absorbs at least 10,000,000 tons per year. The export of coal from England reached, in 1858, 6,078,000 tons. It is estimated that England alone could furnish enough coal for the consumption of the whole of Europe for the space of 4000 years.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, October 20, 1859.

John Agnew, Vice-President, in the chair.

John F. Frazer, Treasurer.

Daniel R. Ashton, Recording Secretary, P. T.

The minutes of the last meeting were read and approved.

Letters were read from the Royal Geographical Society, London; the K. K. Geographischen Gesellschaft, Vienna, Austria; and Capt. C. Wilkes, U. S. N., Washington, D. C.

Donations to the Library were received from the Royal Geographical Society, and the Chemical Society, London; L. A. Huguet-Latour, Esq., Montreal, Canada; Capt. C. Wilkes, U. S. N., Washington, D. C; and from Prof. John C. Cresson, and the American Philosophical Society, Philadelphia, Pa.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement of the receipts and payments for the month of September, was read.

The Board of Managers and Standing Committees reported their minutes.

Candidates for membership in the Institute (17) were proposed, and the candidates proposed at the last meeting (6) were duly elected.

Mr. Howson exhibited a specimen of C. Sharp's breech-loading repeating pocket pistol. It consists of a barrel block having four bores, the block being arranged to slide along the stock to and from the breech, which is stationary. When the barrel block is slided out, a metallic cartridge is inserted into each bore, and the barrel block pushed back and locked against the breech. A very ingeniously contrived rotating nipple on the hammer, strikes one corner of each cartridge in succession. Mr. Howson remarked that more accurate aim could be taken with this pistol than with an ordinary revolver, and that it could be as rapidly loaded and discharged. Patents have been granted in this country, England, France, and Belgium for Mr. Sharp's invention.

Mr. Howson also exhibited a specimen of Mr. Warburton's patent perforated hat. The novelty in this invention consists in using heated points for making the perforations. In piercing the body of the hat with these points, the shellac stiffening melts and a clear hole is made through the body without breaking or crushing the material of which the body is made.

Mr. H. also exhibited J. Higginbotham's improved stop valve, in which the ordinary screw spindle is dispensed with and the valve raised and lowered by means of a cam. The object of this invention is to prevent the leaking of the stuffing box caused by the screw spindles of ordinary stop valves, and to afford facilities for grinding the valve to its seat.

In reply to a question by a member, "If any plan to propel the cars on City Passenger Railroads had been proposed in lieu of horses," it was stated by one of the Committee on Meetings, that the Caloric or Hot Air Engine was about to be applied to that purpose in New York, the first machine being nearly ready for trial; and, from the known fertility of resources possessed by the engineer making it, but little doubt of its success might be entertained.

Another means of propulsion seems to have been hit upon by several persons, as soon as the necessity for some cheaper motor than horse flesh became apparent. The directors of two or three roads, on application, were advised to use compressed air, operating engines of small cylinder capacity, running quickly, and supplied with air of a high density; the motion being transmitted through geared wheels to the driving axles. With either of these plans no change would be required in the existing cars, as the engines could be suspended beneath the floors, or on one of the platforms, whilst the air reservoirs could be placed on either side of the car, and form the seats. If reservoirs of a capacity sufficient to maintain a working pressure during the entire run could not be had, they might be refilled at some intermediate point, say at the intersection of a cross road, where the compressing engines and supply reservoirs might be stationed, thus serving two roads: the time occupied in filling the reservoir being merely that consumed in making the attachment, say one minute. The heavy grades on some of the roads can be overcome by a change of gear wheels operated by the engine man; the engines running at usual speed, whilst that of the car is reduced one-half or one-third. The objections urged against the use of steam, as, danger of explosion, heat and smoke, are nearly removed, whilst the exhaust motor being invisible would give no fright to horses. Vehicles could be warned off the track by an air-whistle, and the approach to a crossing or a connecting road made known. It is said that an air engine is being built for a Philadelphia road by a competent engineer who has just completed a successful locomotive engine driven by compressed air, for a road in the mining region. It has two cylinders of moderate capacity supplied with air of 200 lbs. initial pressure, contained in a reservoir of about 75 cubic feet. With the above pressure it ran about 2000 feet, pushing six loaded drift-cars upon which were clustered over 50 men. No novelty is claimed in the use of compressed air as a motor, numerous experiments and successful workings being recorded in books; but it seems to be specially adapted to this purpose, and will, no doubt, much reduce the running expenses of cars, each of which requires six horses per day to make its usual trips.

Abstract of Meteorological Observations for August, 1859; *made in Philadelphia, Somerset, Dauphin, Adams, and Centre Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.*

PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.

1859. Aug't.	Barometer. Mean.	Barometer. Mean daily range.	Thermometer. Mean.	Thermometer. Daily oscillation.	Thermometer. Mean daily range.	Relative humidity. 2 P. M.	Force of vapor. 2 P.M.	Rain.	Prevail'g winds.
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	Direc.
1	29·830	·079	74·7	25	3·0	47	·543		S W.
2	29·836	·044	79·7	24	5·0	46	·608		S E.
3	29·838	·029	83·7	23	4·0	55	·845		S E.
4	29·738	·109	84·3	25	2·7	62	1·014	0·655	S.
☾ 5	29·717	·035	78·7	12	5·7	87	·886	0·175	S W.
6	29·83	·116	76·7	17	4·0	43	·482		W.
7	29·781	·056	78·0	25	2·0	45	·555		S W.
8	29·810	·040	78·7	21	2·0	40	·528		S E.
9	29·979	·169	76·3	23	2·3	44	·548		E.
10	29·974	·006	75·8	21	2·2	48	·550		E.
11	29·911	·063	74·5	22½	1·3	48	·538		S E.
12	29·822	·089	76·2	15	2·7	61	·655	0·278	S.
○ 13	29·713	·109	79·0	15	2·8	63	·767	0·831	S S W.
14	29·698	·016	80·0	17¼	1·0	53	·683		N E.
15	29·762	·065	78·5	18	1·5	57	·662		N E.
16	29·941	·179	70·5	15	8·0	46	·408		N E.
17	29·956	·026	68·2	19	2·3	43	·374		N E.
18	29·836	·120	70·8	25	3·0	37	·381		(var.)
19	29·733	·103	73·0	24	2·2	31	·337		S W.
20	29·852	·118	71·7	15½	1·3	34	·347		(var.)
☽ 21	29·914	·063	72·0	24½	1·7	35	·367		N E.
22	29·932	·025	71·0	25	1·0	38	·402		(var.)
23	29·939	·036	72·2	24	1·2	49	·533		S E.
24	29·770	·170	74·0	13½	6·2	90	·798	1·483	S W.
25	29·735	·045	75·7	19	5·0	47	·543	0·400	N W.
26	29·804	·069	74·8	22½	1·5	44	·530	0·807	S W.
27	29·775	·028	74·7	20½	2·2	52	·583		W.
● 28	29·797	·022	69·0	12	7·3	63	·465		W N W
29	29·845	·048	63·3	21½	6·3	49	·370		N W.
30	29·816	·029	66·0	24	2·7	36	·317		N W.
31	29·740	·076	68·8	27	2·8	47	·464	0·315	S W.
Means	29·827	·070	74·5	20½	3·1	50	·551	4·447	S 26½° E

SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.

Aug't.	Bar. Mean.	Ther. Mean.	Relative humidity. 2 P.M.	Force of vapor. 2 P.M.	Rain.	Prevail'g winds
	Inch.	°	Per ct.	Inch.	Inch.	Direc.
1	27·612	72·3	59	·649		S W.
2	27·649	72·3	67	·730		S W.
3	27·675	75·7	52	·720		(var.)
4	27·603	75·0	81	·730	1·948	S W.
5	27·612	70·7	71	·671		W.
6	27·706	63·0	64	·554		W N W
7	27·661	67·0	62	·611		W.
8	27·724	70·7	47	·588		E.
9	27·787	75·7	63	·798		W.
10	27·773	78·0	58	·801		S E.
11	27·706	75·0	64	·774	0·242	S E.
12	27·611	71·7	66	·676	0·075	S W.
13	27·591	70·7	67	·657		(var.)
14	27·611	71·0	58	·598		N E.
15	27·646	74·0	46	·576		E N E.
16	27·708	68·0	65	·600		(var.)
17	27·738	66·0	58	·573		S E
18	27·663	63·7	50	·477		N W.
19	27·615	63·3	61	·504	0·043	N W.
20	27·720	60·3	59	·497		N.
21	27·743	62·0	53	·491		S E.
22	27·724	66·3	53	·491		(var.)
23	27·676	66·7	64	·554		S S E.
24	27·576	69·0	59	·623	0·665	W.
25	27·626	64·3	52	·448		W.
26	27·675	63·3	80	·564	0·374	W.
27	27·651	66·0	63	·531		(var.)
28	27·642	60·3	61	·429	0·231	(var.)
29	27·720	53·7	55	·320		N.
30	27·673	56·3	59	·423		W.
31	27·591	61·0	70	·495	0·035	W.
Means	27·668	67 5	61	·585	3·713	

HARRISBURG, Dauphin Co. 40° 16′, N. 76° 15′, W. JOHN HEISELY, M D., Obs.

Aug't.	Bar. Mean.	Ther. Mean	Rain.	Prevail'g winds.
	Inch.	°	Inch.	Direc.
1			2·362	S.
2	29·725	78·7	0·165	S.
3	29·735	83·3		S.
4	29·594	85·0	0·243	S W.
5	29·615	79·3		W.
6	29·752	75·7		W.
7	29·675	76·3		W.
8	29·759	80·3		W.
9	29·879	81·3		W.
10	29·876	81·3		S E.
11	29·798	77·3		(var.)
12	29·697	75·7	0·258	S E.
13	29·598	86·3		(var.)
14	29·605	82·0		W.
15	29·681	80·0		W.
16	29·826	75·0		S E.
17	29·856	72·0		S.
18				S.
19	29·624	72·0		S E.
20	29·788	71·7		N.
21	29·842	70·7		N.
22	29·819	72·3		S E.
23	29·830	72·7		S E.
24	29·641	75·0	1·951	S E.
25	29·622	76·3		W.
26	29·719	74·0	0·325	W.
27	29·672	74·7		W.
28	29·683	71·0		(var.)
29	29·775	65·0		N W.
30	29·727	65·3		N W.
31	29·630	68·7		W.
Means	29·726	75·8	5·304	

GETTYSBURG, Adams Co. 39° 49′ N. 77° 18′ W. Height 624 ft. Prof. M. JACOBS, Obs.

Aug't.	Bar. Mean.	Ther. Mean.	Rain.	Prevail'g winds.
	Inch.	°	Inch.	Direc.
1	29·419	77·3		S S W.
2	29·447	82·3	1·080	(var.)
3	29·465	77·3	0·065	(var.)
4	29·322	80·3	0·375	S S W.
5	29·365	73·5	0·250	(var.)
6	29·464	72·0		S.
7	29·403	71·7		N W.
8	29·497	75·7		S W.
9	29·626	78·3		(var.)
10	29·428	78·0		S S W.
11	29·546	73·3		(var.)
12	29·412	72·7	0·325	(var.)
13	29·295	76·3		W.
14	29·346	76·7		N N E.
15	29·403	78·0		N E.
16	29·562	73·3		N E.
17	29·526	68·0		N E.
18	29·433	66·3		S W.
19	29·351	67·3		N E.
20	29·510	68·7		N N E.
21	29·563	66·7		N E.
22	29·555	68·3		S.
23	29·554	69·0		S S E.
24	29·374	70·3	1·330	(var.)
25	29·379	72·0		W.
26	29·459	71·7	0·265	(var.)
27	29·421	71·7	0·018	W.
28	29·425	66·3		N W.
29	29·527	60·0		N.
30	29·465	60·0		W.
31	29·363	66·3	0·025	S W.
Means	29·465	71·9	3·733	

FLEMING, Centre Co. 40° 55′ N. 77° 53′ W. Ht. 780 ft. S. BRUGGER, Obs.

Aug't.	Ther. Mean.	Rain.	Prevailing winds.
	°	Inch.	Direc.
1	72·3	0·310	(var.)
2	72·7	0·150	S W.
3	72·7	0·080	S W.
4	78·3	0·212	W.
5	73·3		(var.)
6	68·0		N W.
7	69·7		N W.
8	75·3		S E.
9	76·0		S E.
10	78·0		S W.
11	75·3		(var.)
12	71·0	0·560	(var.)
13	71·0		N W.
14	74·3		S E.
15	73·3		S W.
16	72·0		(var.)
17	67·7		S E.
18	66·0		(var.)
19	61·3	0·100	(var.)
20	62·3		N W.
21	65·0		N W.
22	67·7		(var.)
23	69·0		S E.
24	70·3	1·660	(var.)
25	68·0		N W.
26	66·3	0·040	N W.
27	67·0		N W.
28	65·0		(var.)
29	54·7		N W.
30	58·3		W.
31	63·0		S W.
Means	69·2	3·112	

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

DECEMBER, 1859.

CIVIL ENGINEERING.

Steam Engineering in 1859.*

(Continued from page 301.)

STEAM GENERATION.

In the introductory remarks, our readers will have noticed how carefully any exaggeration has been avoided in speaking of *possible* economics in generating and using steam; and we have taken this course, knowing there are many practical engineers of the present day who do not hesitate to speak of $1\frac{1}{2}$ and even 1 ℔. of coal as sufficient to obtain an indicated H. P.; whether such statements will be borne out by any present or future improvements, time will prove. The reason we avoid what may be considered extreme views, is because we wish to stand on firm ground, and have all our statements supported by the general engineering experience of the country.

We propose, therefore, in the spirit of the introductory remarks, to allude simply to facts as they exist, and not to individuals, to attempt to separate the good from the bad, and to point out some of the legitimate improvements that can *always* be realized in the generation of steam, by faith in, and adherence to, the text with which we set out, —that "HEAT IS THE SOURCE OF ALL POWER IN STEAM."

Although the generation of steam or vapor of water has no necessary connexion with the machine in which the steam may be afterwards applied to produce motive power, yet it is generally the custom, in considering results, to mix the two together in such a way as to

*From the Lond. Artizan, June, 1859.

prevent the possibility of arriving at correct conclusions : the diameter of the cylinder is the dimension purchasers look to as the most important, whilst they receive, almost without comment, every variety and size of generator : the consequence of such a practice can be foreseen : the *amount of power* received for a given price varying to the extent of 30 and 40 per cent.

Elaborate and reliable experiments have been made to ascertain the quantity of heat necessary to evaporate a given weight of water, and we receive as ascertained facts the large amount of latent heat in steam, and the different quantities of fuel necessary to raise the temperature of a cubic foot of water from 32° to 212°, and to convert it from 212° into steam. We also take it for granted our readers are familiar with the expansive property of steam ; if not, we cannot undertake to supply such elementary information.

In steam boilers we have two distinctive features—the fire-grate and the heating or absorbing surface—and they are so closely connected and mutually dependent on each other, that if the relative proportion between them be altered, there is an immediate alteration in the results.

It happens that inexpensive boilers in construction are not necessarily economical in performance ; on the contrary, if a small boiler is required to produce a large supply of steam, the result is a considerable waste of fuel ; this remark applies to all descriptions of boilers, for land or sea.

If all the heat developed in the combustion of 1 ℔. of the best steam coal be utilized, it will evaporate from 14 ℔s. to 15 ℔s. of water at 212°. How near do we arrive at such a result in ordinary practice ? —certainly not within 40 per cent. Ordinary land and marine boilers do not evaporate more than from 7 ℔s. to $8\frac{1}{2}$ ℔s. of water at 212° per 1 ℔. of fuel ; in fact, it has been stated on good authority that the average duty of land boilers in the Lancashire districts does not exceed from 6 ℔s. to 7 ℔s. of water at 212° evaporated by 1 ℔. of coal. There are instances of 10 ℔s., 11 ℔s., and $11\frac{1}{2}$ ℔s. of water at 212° being evaporated by 1 ℔. of the best fuel ; and if the late Newcastle experiments can be relied on, nearly 13 ℔s. was evaporated ; but this latter duty in an ordinary marine boiler, although with fresh water, is so far above what is realized in general practice, and so *very near* the theoretical value, that we cannot at present admit it in our calculations ; it may, however, be conceded that fully 11 ℔s. of water at 212° can be evaporated by 1 ℔. of good steam coal,—an improvement of more than 30 per cent. on the general practice of the present day.

In generating steam there are two chief sources of waste—radiation, and the heated gases allowed to escape through the chimney. The first can be partly removed by clothing the boiler with non-conducting material ; the second is the most important and the most difficult to contend with.

In locomotives the temperature of the escaping gases is upwards of 1000° ; in land boilers, from 400° to 600° ; and in marine boilers, from 500° to 900° ; in each case depending to a great extent upon the rela-

tive proportion between the fire-grate and the absorbing surface, or, more correctly, between the amount of fuel consumed in a given time and the absorbing surface. And this brings us to the real practical difficulty of combining economy of fuel with the development of great evaporating power in a boiler of a given size and weight.

The amount of evaporation in a given time in steam boilers of the same type, is proportional to some extent to the difference between the temperatures of the escaping heated gases and the water to be evaporated with a given absorbing surface: the higher the temperature of the said gases the greater the evaporation in a given time, and the greater the amount of fuel required to evaporate a given quantity of water. On the other hand, the nearer the temperature of the escaping gases approximates to the temperature of the water to be evaporated, the less the evaporation in a given time, and the less the amount of fuel required to evaporate a given quantity of water.

In the above statements it is assumed in each case the boilers are of similar construction and worked under similar circumstances, the only difference being in the ratios of the absorbing surface to the amount of fuel consumed in any given time: the truth of the above is seen every day. In one case (we state actual instances,) there is a marine boiler having 1600 feet of absorbing surface, and 80 feet of fire-grate, or a ratio of 20 to 1, the combustion is at the rate of 24 lbs. per sq. foot of fire-grate per hour, the escaping gases have a temperature of upwards of 800°, $6\frac{1}{4}$ lbs. of water is raised from 100° to 260°, and evaporated by 1 lb. of fuel, and 190 cubic feet of water are evaporated per hour, or 1 cubic foot to $8\frac{1}{2}$ sq. feet of absorbing surface.

In another instance, we have a marine boiler of similar construction and proportions, except in the ratio of fire-grate to absorbing surface, the latter being, 1200 sq. ft., and the former 40 sq. ft., or a ratio of 30 to 1. The combustion is at the rate of 16 ℔s. per sq. ft. of fire-grate per hour; the escaping gases have a temperature of 450°; $8\frac{1}{2}$ ℔s. of water are raised from 100° to 270° and evaporated by 1 ℔. of fuel, and 87 cubic ft. of water are evaporated per hour, or 1 cubic ft. to $13\frac{3}{4}$ sq. ft. of heating surface.

These boilers are working under like circumstances, and, leaving out decimals, the figures given are substantially correct, and fully illustrate the connexion, previously stated to exist, between the temperature of the waste heat and the duty and economy realized.

If engineers had simply to generate steam with the least possible expenditure of fuel, regardless of time, and the cost, weight, and capacity of the generator, the problem could be solved with comparative ease, but the case is totally different; a certain weight of steam has to be produced in the least possible time with the least possible cost, weight, and capacity of the generator, and, above all, with the least possible expenditure of fuel—regard being had also to durability and facilities for repair. Here we have the most conflicting conditions, and it cannot be matter of surprise if mistakes have been, and are being made, it being only necessary that one element be over-valued or another be under-valued, to insure an unsatisfactory result. One manu-

facturing engineer swears by his fire-grate, another by his heating surface, and another by his proportion or form of flues; it matters not which is the favorite view (one may be adopted with less injury to the purchaser than another); nothing short of an impartial consideration of each and *all* of the requirements in generating steam can meet the difficulties of the case.

If such impartial consideration was the general rule, there would be no occasion for the present remarks.

The history of the locomotive boiler clearly shows how little previous design has had to do with its present efficiency; the necessity of using high pressure steam, and the difficulty of condensing, led the way to the blast; and it must be admitted that, of all kinds of boilers, the locomotive is the most scientific and the most economical, if allowance be made for the peculiar requirements connected with its use.

Notwithstanding the temperature of the smoke-box is often 1000°, with a combustion of from 60 to 120 lbs. of fuel per square foot of fire-grate per hour, a larger amount of water is evaporated by a given weight of fuel than in the majority of land or marine boilers. The rapid combustion is more perfect—almost every portion of the boiler is protected by non-conducting materials—less than 7 ft. of heating surface is sufficient to evaporate a cubic foot of water—and 1 lb. of Welch coal will evaporate $8\frac{1}{2}$ to 9 lbs. of water: nevertheless, there is much unnecessary waste of fuel in the high temperature of the escaping gases (although they are not, *comparatively*, so high when the temperature in the furnace is considered), and in supplying the feed-water at a low temperature. With the introduction of coal as fuel, modifications may be required in the furnace and tubes; and there is much reason to believe, from comparative experiments, that *crowded* tubes do not allow the steam to escape to the steam space as quickly as it is generated.

We may confidently look to a considerable increase of economy and efficiency in the locomotive boiler, even though now for weight, space, cost, and economy of fuel, it must be placed at the top of the list, and certainly deserves the least criticism.

The duty and economy of steam boilers are mainly dependent on the rate of combustion, the ratio between the heating surface and the fire-grate, and the ratio between the heating surface and the consumption of fuel per hour, thus:—

Rate of Combustion.

Cornish boilers burn per square foot of fire-grate,	4 lbs.
Ordinary land boilers, . . .	12 "
Marine boilers, . . .	18 "
Locomotive boilers, . . .	100 "

Ratio between Heating Surface and Fire-grate.

Ordinary land boilers, . . .	12 to 1.
Marine boilers, . . .	27 to 1.
Cornish boilers, . . .	36 to 1.
Locomotive boilers, . . .	75 to 1.

RATIO OF HEATING SURFACE TO RATE OF COMBUSTION.

Cornish boilers, . . .	9·0 to 1.
Marine boilers, . . .	1·5 to 1.
Ordinary land boilers, . . .	1·0 to 1.
Locomotive boilers, . . .	0·75 to 1.

The preceding figures are only approximate, but they represent the particular features of each class, and if we were to tabulate them according to the *economy* generally realized, the Cornish boiler would stand first, the marine second, and the common land boiler third; for obvious reasons, the locomotive boiler cannot be fairly classed with the other three.

If we take as a standard the *rate of evaporation* for a given quantity of heating surface, we must place the common land boiler first, the marine boiler second, and the Cornish boiler third; and here again the locomotive boiler must be omitted as an exceptional construction.

In such general remarks and statements as the preceding, it is not necessary that they should represent the experience of all our readers —they are based on actual practice, and suffice to illustrate the subject under discussion, and point out the connexion always existing between sound principles and successful practical engineering.

It is assumed, as generally acknowledged, that from 30 to 60 per cent. of fuel is wasted in generating steam, and that a considerable amount of this waste ought to be, and can be, avoided; and although we do not dictate the exact means for accomplishing this, we can easily trace out, in the majority of cases, the direction of the improvement required.

Boilers made and used in districts where fuel is cheaply obtained have never been remarkable for their economical performances, nor are the engineers in those districts famed for great anxiety to introduce improvements for economizing fuel; it cannot be expected, and we are not surprised to know that land boilers in coal districts only evaporate 6 lbs. of water at 212° by 1 lb. of fuel.

With wagon or plain cylindrical boilers, that form such a large proportion of those now in use on land, economy of fuel is simply a question of size to produce a given weight of steam, it becomes almost entirely a question of capital; an increased ratio between the heating surface and the fire-grate is in this case the desideratum; the furnace flues and chimney being well proportioned, and every effort made to check radiation.

In the Cornish boiler, where the furnace is *within* the inside tube or tubes, that temperature in combustion which is so essential to its perfection is not easily obtained; hence the difficulty that arises in attempts to consume the smoke in such furnaces; an increase of duty and economy would ensue from placing the furnace *under* the boiler, and returning the heated gases through two smaller tubes—a plan that has been often tried with universal success; it allows ample space in the furnace, insures perfect combustion, and has also other mechanical advantages.

In other descriptions of land boilers, where additional heating surface is introduced within the main shell, if well proportioned, they are

generally more economical than the Cornish boilers with the same ratio of heating surface to fire-grate, and with the same rate of combustion.

There can be no doubt that, for land purposes, a boiler with internal flues, capacious furnace, a greatly increased ratio between the heating surface and the fire-grate, and a rate of combustion above that in general practice, is the cheapest, the most effective, and the most economical.

There can be—indeed there is—no difficulty with such boilers in realizing an increased economy to the extent of 30 per cent., and in obtaining a greater effect in a given time from a ton weight of boiler.

We must defer to next month our investigation of the present state and future prospects of steam generation in marine boilers—the most important branch of our subject. If there are reasons why we should economize fuel on shore, how much stronger do they become when it is a question of freight as well as of fuel saved.

In addition to the purely economical value of steam boilers, we shall hereafter have to consider their mechanical construction, especially as affected by the introduction of steam of high pressure.

In concluding these remarks, we would impress on our readers that our only wish is to direct attention generally to present defects in the Steam Engineering of 1859, and to point out to young engineers those paths of improvement where their energies and talents will be productive of real benefit to their profession, and to the world at large.

(To be Continued.)

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*Under Sunk Foundations.** By C. I. SPENCER, Resident Engineer of Chunar Division, East India Railway.

The following remarks on the subject of well-sinking in bridge foundations embody the experience gained in sinking the foundation wells of a bridge over the Jurgoonullah, a hill stream which runs into the Ganges a few miles below Chunar.

Such knowledge being derived from one job is necessarily partial and limited, and is only offered as a contribution towards the general stock of information wanted on a very interesting subject; and I shall be thankful to any one engaged on similar works who will correct, from more complete information, any erroneous conclusions I may have come to, or raise a discussion on any doubtful point.

The Jurgoo well-sinking, which was commenced in October, 1857, has just been brought to a successful termination, and what few mistakes were made at starting in points on which we had not the light of experience to guide us, have not involved any serious ill consequences, and are now fruitful of instruction.

In deciding upon the use of under sunk foundations in preference to piles, coffer dams, or any other expedient, it is necessary to take into consideration the form and material of the bed of the river to be bridged, the floods to which it is subject, and their tendency to scour to any given depth.

In these particulars the Jurgoonullah is so circumstanced, as to ren-

* From the Lond. Civ. Eng. and Arch. Journal, Sept., 1859.

der it unsafe or difficult to use any other kind of foundation than the one adopted. The bed at the point bridged, consists almost entirely of sand, gravel, and other loose drift material, to a depth of about 20 feet, below which occurs a stratum of pure white sand of unknown thickness, which extends under the strong kunkury clay at the banks of the nullah, and has evidently never been disturbed by the action of the stream.

The stream itself is a mere hill-torrent, rising above 20 feet in two or three hours and falling again as rapidly; in the dry weather it does not rise above its bed, but stands in pools in the sand. Besides the hill floods, the nullah is subject to overflow from the backwater of the Ganges, and the alternating and sometimes combined action of these floods gives rise to alternate scourings and fillings of a kind very difficult to foresee or provide for.

The only certain principle therefore upon which it was possible to proceed was to assume that what the water had done it would do again, that the scour would reach on some future occasion the depth it had reached before, and having ascertained this limit, to sink the wells to what might be considered a safe distance below it, and there leave them in the white sand which there appeared no hope of getting to the bottom of.

In such a situation piles would have been useless, the stuff would have been washed out from between them, and the bridge been left standing on the naked sticks; sheet piling could never have been driven deep enough to defend them from the scour, and to have sunk coffer dams 30 feet into the bed, dredged out the stuff, and filled the bottom with concrete, might have been a safe plan, but would certainly have been a tedious and expensive one.

Having then once determined on the use of wells, the next thing was to find out the proper dimensions and arrangement, as well as the best form of curb and mode of attaching it to the masonry. In all these particulars, the one great object to be attained is to make a well which shall *sink*, for if by any accident or defect in design or construction, one of the wells should stick half way and obstinately refuse to budge an inch, a contingency which sometimes happens, it is next to impossible to get it out again, and the engineer may be placed in the unpleasant position of having to alter his design and begin foundations in a new place.

Before considering the causes which tend to impede the descent of wells, I shall describe the different modes adopted for sinking them.

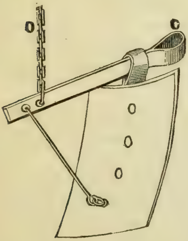
In every case the first step is to lay the curb on the surface, as low down as possible, and build the wall to a height above it, equal to somewhat less than its own diameter; the sand and stuff is then cleaned out from the interior, and leaves a hollow into which the well sinks. For the first few feet the men can stand in the water and lift the sand out easily enough, but as the water gets deeper, it becomes necessary either to get rid of the water or to contrive some way of working under water.

The first plan, viz: getting out the water, is, when feasible, by far the most speedy and satisfactory, and it may sometimes be advisable

even to go to the expense of a steam engine to work the wells dry. Where this cannot be done, or where the quantity of water is not so great as to require it, the pumping may be done more awkwardly, but more cheaply, by means of buckets and pulleys worked by coolies. A large amount of the Jurgoo well-sinking was done by these means: two or three leathern buckets or rather bags (*mhotes*), each pulled by eight or ten coolies, were let down each well, and with European superintendence and energetic driving, it was found possible in most cases to lower the water in three or four hours sufficiently for the men to stand in it.

2. When the water cannot be got low enough, or even while it is in process of lowering, the stuff may be got out by means of divers, who go down with a small iron plate, with which they shovel the sand into a basket, which when full is drawn up by a couple of women. The divers stay about 15 seconds under water, and will often fill a basket at one dive, but they soon get tired, and it was found necessary to have four relays of them every day, and to pay each of them four annas per diem, or about three times the pay of an ordinary coolie.

3. The jham is used in cases where the water cannot be lowered and is too deep for divers. It consists of a plate of iron about 2 feet square; at the upper end is a collar C, into which is inserted the end of a pole which is about 4 or 5 feet longer than the depth of the well: the jham with the pole fixed is dropped with some force on to the bottom of the well, and the pole is moved about by the men above, so as to work the edge of the iron as deep as possible into the soil. The chain O is then drawn up by means of a windlass, the collar C disengages itself from the spindle end of the pole, the lower end of the shovel is lifted up, and the jham plate hangs like a scale pan, with a certain, or rather a very uncertain, quantity of stuff in it. This has to be lifted slowly and carefully, so that the water may not wash it away. When it reaches the mouth of the well the contents are drawn out, the pole fixed, and the whole contrivance dropped once more to the bottom.



The jham works sometimes very well in sand and loose material, and I have seen them at the Jumna coming up with about a cubic foot of stuff on them; but it is at best a capricious thing, and often comes up empty or with the merest spoonful of earth on it, especially when used to get up hard clay or kunkury sand. I do not know who was the inventor of this singular instrument, but he must have been in India a long time, and have got the idea of a codalee irretrievably fixed in his mind. It is, however, as far as I know, the best instrument that has yet been invented for the purpose. I have seen dredges tried, but never heard of one being applied successfully. There was one tried at the Jurgoo, but the buckets had a trick of getting upside down, or hind part before, or any way but the right one. They have,

I believe, been since tried at the Jumna, and it would be interesting to know how far they have succeeded. The one used at the Jurgoo consisted of a set of small scoops or buckets fastened at intervals of about 2 feet along a couple of ordinary chains, which passed round a couple of rollers at top and bottom of a square frame inside the well; one of these chains was constantly gaining on the other, and the buckets getting tilted up at one side. To obviate this I would propose making each pair of links the full length of the distance between two successive buckets, and making the roller of a polygonal form, each side being equal to the length of one link.

I do not, however, think that a dredge is the thing required for well-sinking. It is too large and too heavy, and takes too much time in fixing and lengthening, and is too expensive in proportion to the total cost of sinking. What is wanted is some machine that can be worked like a jham at the end of a pole, but which will be more certain in its action and less liable to come up empty—something which can be lifted out of one well into another easily and readily without carpenters, and not keep all your coolies waiting for more than half an hour at most.

I submit the question to the ingenious among your correspondents: if any of them can solve it in a good, practical, practicable form, he will supply a great desideratum in Indian public works.

Such are the chief methods which have been employed to sink the Jurgoo wells.

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*Mann's Patent Safety Apparatus for Steam Boilers.**

The accompanying wood cut exhibits a front elevation of a very simple and ingenious apparatus invented by Mr. Mann, the engineer of the City of London Gas Works.

The contrivance is intended to record the proper attention or neglect to the testing the ordinary water and steam-cocks of boilers, and accurate register of the steam-pressure within the boiler may be secured by the same instrument. It is applied very readily to any steam-boiler, and in any convenient position.

The following is a description of the apparatus:—

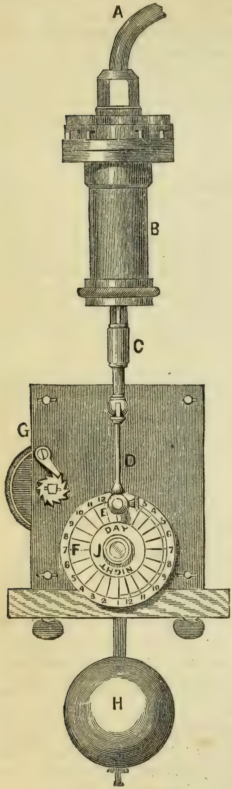
The pipe A admits steam to a spring piston in the cylinder B, which descends in proportion to the pressure of the steam in the boiler; the arm C is fixed to the end of the piston-rod, and is carried downwards with it; the nature of the arrangement will have an *upward motion*, hence, as the pressure of the steam increases, the pencil E, in the pencil bar O, will be drawn up to one of the circular lines of pressure on the diagram paper or card.

E is the pencil, which can be removed in a moment, if required, by simply throwing up the lever, in which condition it will remain, until the pencil is replaced, when it is again brought down and left to keep the pencil up to its work, by a gentle pressure received from the spring at its upper end.

The eight day clock, of which the barrel, G, is seen, carries round

* From the Lond. Artizan, August, 1859.

once in 24 hours, a metal disc, to which is fixed by the thumb-screw, J, the paper or card disc having thereon circles corresponding to the steam pressure from zero to 40 lbs. (or higher if required), and radial lines equal to the twenty-four hours of the day.



The apparatus works in the following manner:—Upon the gauge-cocks being tried at the intervals of time during the day or night for which the circular card has been divided, that shown in the accompanying diagram having divisions of one hour, although there may, in practice, be two, four, or more divisions in the hour. The piston is caused by the pressure of steam above it (admitted from a suitable pipe connected with the gauge-cocks), to descend, and carry the pencil downward toward the centre of the card, making a radial mark thereon to an extent corresponding with the change of pressure—the time of opening the cock being recorded by the rotation of the card by the clock-work, so that should the attendant not be present and open the cocks at the proper time, the division or line upon which the mark should have been made will have passed the point of the pencil and the line of its course.

This apparatus is both simple and ingenious. It has been used most successfully at the City Gas Works for many months past, and it deserves to be better known and more generally adopted.

We are glad to perceive attention is being called to the want of such apparatus, as will be seen by the following extract from the report of Mr. Longridge, of Manchester:—

"In reference to the boilers which sustained injury, in consequence of deficiency of water, it is mentioned that in one case the explosionwas caused by fracture of the blow-off pipe which, during the night, allowed the water to escape unobserved by the watchman, who continued firing after the boiler was empty. In the other two cases the feed-valves appear not to have been tight, and, on preparing to start in the morning, the water in the boilers was driven back by the increasing pressure of the steam, and the furnace crowns much injured in consequence. Though these boilers were provided with glass tube-gauges and floats, these appear to have received no attention at the time, thus pointing out the necessity of employing other means of safety."

AMERICAN PATENTS.

List of American Patents which issued from September 13, to September 27, 1859, (inclusive,) with Exemplifications.

SEPTEMBER 13.

97. Lamp Chimneys; Elias J. Hale, Foxcroft, Maine.

Claim—Contracting the chimney above the flame, and admitting at or near the same point a current of air, in the manner set forth.

98. Exhaust Pipe for Steam Engines; Robert Hale, Roxbury, Massachusetts.

Claim—An exhaust pipe, constructed as described, and having an opening and a steam pipe, in combination with a lip, operating in the manner set forth.

99. Excavator; William Hamilton, St. Catharine, Missouri.

Claim—1st, In combination with an excavator frame, constructed as described, having the side timbers braced in front only, I claim four wheels, when arranged in relation to the said frame, so that a common cart may either be backed between the hind wheels, or pushed over said wheels and frame, under the excavator, when the same is hoisted to be discharged. 2d, The combination of an excavator with a frame, having the rear ends of each of the side timbers bifurcated for the reception of the wheel, the same being arranged to turn on a pin or journal, extending transversely through the two forks. 3d, The peculiar arrangement of hanging the excavator to the frame by means of arms, the same being so pivoted at the ends respectively to the excavator and side timbers, as that they shall be exposed to a tensile strain in the draft line, or thereabout, during the excavating operation of the machine.

100. Barrel Syringes; Stephen P. Hart, Boston, Massachusetts.

Claim—The spring, as applied to the syringe, operating in the manner set forth.

101. Churn; Malachi B. Hassler, Columbia City, Indiana.

Claim—The arrangement of the hinged curved leaf, in combination with the wings, arranged as described.

102. Construction of Segmental Circular Saws; R. K. Hawley, Baltimore, Maryland.

Claim—A segmental veneer saw, the blades of which are formed, hung, and clamped, in the manner described.

103. Grinding the Teeth of Mowers and Reapers; David Hinman, Berea, Ohio.

Claim—The circular grooves on the faces of the grindstone in connexion with the standards and holder, arranged and operating in the manner specified.

104. Mangle; W. W. Hollman, Eddyville, Kentucky.

Claim—The combination of the levers with one of the rolls and balancing lever, as set forth.

105. Mode of Manufacturing Telegraph Cables; W. H. Horstman, Brooklyn, New York.

Claim—Constructing the cable by the apparatus, consisting of the reservoir, wrapping apparatus, &c., or their equivalents, as specified. Also, the final reservoir for coating a telegraphic cable after it has passed all the other apparatus, and before it has entered the water or ground, constructed and applied as specified. Also, the manufacturing of the cable, in the manner described, at the time it is laid, so as to perfect it and at once launch it into the place where it is to remain, whereby I avoid all the chances for injury and imperfections arising therefrom, growing out of stowing and handling the cable after it has been made, as heretofore has been done.

106. Harvesting Machines; A. H. Inskeep, Middleburg, Ohio.

Claim—1st, The arrangement of the revolving, spiral, cone-shaped cutter or gatherer with the base of the cone in front, to gather up and draw the grain back to either stationary or reciprocating cutters, as described. 2d, The combination of the spirally-formed gatherer or cutter, arranged as described, with the divider, guards, and stationary cutters.

107. Cultivators; W. D. Johnson, Raleigh, North Carolina.

Claim—The bars, curved so as to form handles at one end, and having horizontal oblique positions to form the body of the frame, the draft bar, and guide or retaining bar, the front ends of the bars being connected or secured together by the collar or loop, in combination with the double scraper.

108. Seeding Machines; W. D. Johnson, Raleigh, North Carolina.

Claim—The arrangement of two distributing slides with the projections on the wheels, and two or more compartments in the hopper, inclined tube, inclined draft bar, and adjustable roller standard.

109. Boilers for Making Paper Pulp from Wood; Morris L. Keen, Rogers' Ford, Pennsylvania.

Claim—A boiler for boiling, under pressure, wood and ligneous materials for making paper pulp, constructed with an expansion chamber, stirrers, and discharge valve or cock, arranged in the manner stated.

110. Cultivators; Asa M. Keith, Kosciusko, Mississippi.

Claim—The arrangement of the double scraper, the hoe drum, and the hillers or coverers, in their relation to each other and to the parts of the frame to which they are attached, as set forth.

111. Movable Tops for Carriages; John C. Kimball, New Haven, Connecticut.

Claim—So constructing the standards or supports of a standing carriage top, and attaching them by means of screws, that the top and standards or supports may be readily removed, when the whole is constructed and connected substantially as described. Also, the combination of the standards with the body, when the standards are secured, being screwed into the upper ends of the studs, and the whole is constructed as described.

112. Locomotive Lamps; Nelson J. Knapp, Chicago, Illinois.

Claim—The combination of the ellipsoidal and paraboloidal reflectors and burner, arranged as set forth.

13. MACHINE FOR ARRANGING PEGS; Jessé Ladd, Holderness, New Hampshire.

Claim—A machine or combination, consisting of the following devices, or their mechanical equivalents, viz:—1, The grooved cylinder, furnished with a hopper or other proper means of supplying it with pegs. 2, The guiding receiver. 3, One or more advancers, and the operative mechanism thereof. 4, A device or mechanism for discharging from the guiding receiver the refuse pegs. 5, The springs or devices for preventing the discharge of the pegs from the guiding receiver, when they may be disposed therein with their butts in advance of their points. 6, The receiving spout. 7, The peg-carrier; and 8, Mechanism for advancing the pegs through the said carrier. Also, in combination with the said machine, or its hopper and grooved cylinder, an agitator, or means of shaking or agitating the mass of pegs in the hopper, or its conductor. Also, in combination with the said machine or its receiving spout, the serrated bar, operated as described, or mechanism for insuring the descent of the pegs within the receiving spout. Also, in combination with the said machine or with the receiving spout and peg-carrier thereof, the device or part, U, made to operate in manner and by means specified. Also, in combination with the said machine or the receiving spout thereof, the door and its operative mechanism, whereby the surplus pegs may be discharged from the spout after it may become sufficiently supplied with pegs. Also, in combination with the said machine or its spout, the finger, or equivalent, to be operated in manner and by means as described.

114. BOARD MEASURER; Augustus Lafever, Battlecreek, Michigan.

Claim—1st, The employment or use of the cone gears and sliding pinions, in connexion with an endless toothed or serrated chain fitted within a suitable case, arranged with gearing and indexes, and with or without the arm and lever. 2d, The arrangement of the yielding frames with the pinion and cone gear, respectively attached to levers and racks.

115. DUMPING CART; John S. Lash, Carlisle, Pennsylvania.

Claim—The employment or use of the curved or segment rack attached to the rod and provided with the ledge, the pinion and hooks, arranged as set forth. Also, the rod provided with the spring, and connected to the sliding or pressure bar provided with the arm, the above parts being applied to the cart, and arranged to operate as set forth.

116. CORN PLANTERS; William Lees, Germantown, Ohio.

Claim—The cylinders, in combination with the hoppers with reference to the feed bar, arranged to operate as set forth.

117. PIANO-FORTES; Ferdinand C. Lighte, City of New York.

Claim—1st, The crystal reverberator of glass, or other material, applied below or at the back of the sound-board, in combination with openings therein, as described. 2d, The insulators, applied between the iron frame or plate, and the rest plank and wooden blocking of the instrument, in such manner that the said frame or plate will bear upon the plank and blocking only at few points, as described.

118. TOBACCO PRESSES; George Lindsey and Wm. Cameron, Petersburgh, Virginia.

Claim—A portable hydraulic jack, or other powerful press, so constructed as to be readily applied to an ordinary or to a series of ordinary screw presses, for the purpose described, and adjustable as to height on the truck on which it rests, in combination with the railroad track, E, at right angles with the track, B, when said press is used for increasing the pressure of the screw press and converting it into a retaining press, as described.

119. LOCK AND DETECTOR; John H. Lyon, City of New York.

Claim—Combining with a padlock, or any lock provided with a shackle, a supplemental shackle, arranged with a lead or soft metal tube, so as to be temporarily secured thereby to the lock case, and admitting of being released only by the severing of the said tube, which thereby serves as a detector. Also, forming the lock case of two parts, with a division plate between, whereby the construction of the lock is rendered extremely simple, and the invention enabled to be carried out or produced at a moderate cost.

120. STEERING APPARATUS FOR BARGES IN RIVERS; Murdock Lytle, Alleghany, Pennsylvania.

Claim—The application of a wheel to the bow of a barge, so that said wheel shall revolve at right angles to the direction of the barge, in combination with an apparatus for operating said wheel by the power of the propelling boat.

121. SEEDING MACHINES; Jacob Maize, Wooster, Ohio.

Claim—The adjustable cultivators provided with the arms, guides, and the adjustable jointed harrow, arranged as described, and acting conjointly with the seeding apparatus, in the manner set forth.

122. DOVETAILING MACHINE; W. A. McDonald, Mott Haven, New York.

Claim—1st, The employment or use of spiral saw-cutters attached to the rotating heads connected by gearing. 2d, In combination with the cutters, the adjustable platform. 3d, The combination of the cutters, platform, and gauge, operated by the screw, for the purpose set forth.

123. CULTIVATORS; Edmund and Benjamin Miller, Rising Sun, Indiana.

Claim—The combined arrangement of the guard, elevated wing, curved horizontally in two directions, adjusting shank, and bracket, operating in connexion with a shovel plough, in the manner set forth.

124. SHINGLE MACHINE; Henry Miller, Grafton, Virginia.

Claim—The manner of tilting the bed, by means of the adjustable wheel on shaft, actuated by the ratchet also on said shaft, the pawl on the framing, spring attached to the carriage, and spring attached to the framing, and acting on the bed, the whole being arranged as set forth. Also, the arrangement of the bed and rods attached to the framing, as shown, to admit of the vertical adjustment of the bed, for the purpose of graduating the thickness of the shingles.

125. COTTON SCRAPERS; Jonathan H. Mitchell, Germantown, Tennessee.

Claim—1st, The combination and arrangement of the beam, chair, mould-board, and share, operating, as set forth. 2d, The adjustable and changeable share, arranged and operating as set forth.

126. CORN PLANTERS; William Morrison, Carlisle, Pennsylvania.

Claim—A corn planter, constructed with the mould-boards, adjustable cutters or coverers, hopper, slides, and clearers.

127. PLOUGHS; William O'Neill, Pine Level, Alabama.

Claim—The lapping land-sides of the ploughs and the bar, attached to the beam, as specified, in combination with the bolts, nuts, and braces described, whereby they may be formed at pleasure into a double or hill-side plough.

128. Ploughs; William O'Neill, Pine Level, Alabama.

Claim—The arrangement of the adjustable mould-boards, attached to the share by bolts, and constructed as described, with braces, stock, and share, and point.

129. Lamps; George T. Parkhurst, Baltimore, Maryland.

Claim—The flattened air tubes, bent at right or other convenient angles, with a slit or opening at the outer angles, in combination with flat wick tubes, and the combination of the above parts with the cap or dome, made or operating as described.

130. Carriage Springs; Stephen B. Peet, City of New York.

Claim—A compound spring, composed of a combination of an elliptic leaf or leaves and a volute coil.

131. Sausage-stuffer; John G. Perry, Kingston, Rhode Island.

Claim—Combining the cylinders, having a spiral cavity or cavities, with the follower, as described.

132. Horse Rakes; Orris Pier, Ludlow, Vermont.

Claim—The combination of the adjustable bar, I, lever, bar, E, rods, rake, strap, and seat, as described.

133. Boilers and Steamers; Daniel R. Prindle, Bethany, New York.

Claim—The so turning or forming the flanch of the upper section that it will contain water to prevent the fire from burning the packing beneath the flanches.

134. Seeding Machines; S. G. Randall, New Braintree, Massachusetts.

Claim—The arrangement and combination of the series of plate wheels, seed boxes, and horizontal bar, so that as the bar is drawn along, the plate wheels shall assume an oblique position.

135. Skiving Machines; J. A. Safford, Winchester, Mass., and John W. Chase, North Weare, N. H.

Claim—1st, Hanging the gauge roll in vibrating frames, in combination with the spring and retaining spring-catch, and adjustable stops, arranged as specified. 2d, The over-lapping knife, in combination with the adjustable spring apron, arranged as specified.

136. Carriage-tops; Francis C. Shaffer, Brooklyn, New York.

Claim—The arrangement and combination with the curtains, of the hooks, guides, and supporters, so that the curtains may be kept stretched, and be readily lowered or raised and secured overhead, within the carriage at any desired point.

137. Spirit Level; Thaddeus S. Scoville, Rochester, New York.

Claim—Employing a single transparent cell or cistern of spirits, or other fluids, in combination with the scale and rectangular stock, in such a manner that the surface line of the liquid shall indicate both the horizontal and perpendicular, with the intermediate degrees.

138. Seeding Machines; Harvey Sloan, Franklin, Indiana.

Claim—1st, The arrangement of shanks, drag-bars, levers, bar, rest, and support, combined and operating as specified. 2d, In connexion with the subject of the first claim, the arrangement of rollers, seed boxes, and slides, constructed as specified.

139. Railroad Car Seats; C. A. Smith, Piermont, New York.

Claim—1st, The arrangement of the back and bottom of a car seat, so that when the seat is adjusted to an inclined position both parts to move together on the same pivot on which the back moves, independent of the bottom, when the seat is reversed. 2d, The spring catch, notched arc, bottom, and back, arranged as described.

140. Cotton Seed Planters; P. M. Smith and T. T. Collier, Lavernia, Texas.

Claim—The arrangement and combination of the wheels, axle, crank, pulley, slide, agitator, fender-bar, plough-share, and scraper, as described.

141. Thimble; James C. R. Steirly, Brooklyn, New York.

Claim—The combination of the thimble and cutter, in the manner set forth.

142. Cooking Stoves; David Stuart, Philadelphia, Pennsylvania.

Claim—Combining with the hollow cross-piece the distributor, arranged as set forth.

143. Folding Chair; J. H. Swan, City of New York.

Claim—1st, The arrangement of the back, seat, and arms, so that the back and seat, when occupied, will be nearly counterpoised, and the arms moved with the seat and back. 2d, In combination with the back, seat, and arms, the curved legs, arranged so as to admit of being completely folded.

144. Churn; James Taylor, Rushville, Illinois.

Claim—The peculiar construction and arrangement of perforated brakes and auxiliary reflectors, in combination with a dasher, having its blades flattened out gradually from near the shaft to their ends.

145. Machinery for Forming Hat Bodies; James S. Taylor, Danbury, Connecticut.

Claim—The combination of the two perforated cones and exhaust, with one picker and feed arrangement, so arranged that the current of impelled fur is alternately shifted from the tip of one cone across on to the tip of the other, in such a manner as to give the required proportions in forming a perfect hat body.

146. Washing Machine; George W. Tolhurst, Liverpool, Ohio.

Claim—The inside bottom box constructed air-tight, so that when the pressure of the upper rubber is removed it will float, and expose the clothes to be handled.

147. Seeding Machines; M. L. Tourtelett, Neshonoc, Wisconsin.

Claim—The combination and arrangement of the levers, connected by the traverse rod, the cam, and the slides, for joint operation.

148. Hygrometer; Louis S. Ullmann, Nashville, Tennessee.

Claim—The combination of the capsule and naturally spiral tail-like appendage of either of the plants specified, with an index or dial, or their equivalents, substantially as described, to constitute a hygrometer.

149. Machine for Weighing Grain, &c.; John Van Horne, Magnolia, Illinois.

Claim—Weighing, by means of a round ball or self-acting weigher, operating in a concave beam, or

balance and blocks, and spiral springs, working in the bottom of the beam by means of the grooves, so as to weigh different weights or drafts, H, and board, combined, for the purposes set forth.

150. MACHINES FOR RAKING AND LOADING HAY; Thomas J. Wallace, Cameron, Illinois.

Claim—1st, A hay-raker and loader, arranged and combined together as described. 2d, The combination of the inclined part, A, with its pivot, with the part, A, of the main frame and slot, as set forth.

151. CARPENTERS' RULE; Hamlin Whitmore and David M. Smith, Springfield, Vermont.

Claim—The spiral springs applied to the pintle of the joint, in combination with the elastic bearings of the plates provided with notches and projections, as set forth.

152. CORN PLANTERS; Charles Whitaker, Davenport, Iowa.

Claim—The arrangement of the seed boxes or receptacles, slides, stationary plates, and movable plate, with the arms and weights attached.

153. GRATES; J. S. Williams, St. Louis, Missouri.

Claim—The combination of the stove grate having register plates and valves which admit unheated air from the room at all times, through the bottom of said plates, but control the flow of heated air into the room with the ordinary fire-place, when the latter is separated from the flue above by a simple fire-board.

154. PLOUGHS; W. B. Williams, Warrenton, North Carolina.

Claim—1st, The combination of screw-bolts, nut in beam, standard, cuff, and slotted brace, to regulate the depth of ploughing. 2d, And in combination with the above, the curved arm for collecting weeds.

155. PLOUGHS; W. B. Williams, Warrenton, North Carolina.

Claim—The combination of standards, plate, and oblique wings, with share.

156. CONVERTING ROTARY INTO RECIPROCATING RECTILINEAR MOTION; Albert Broughton, Malone, New York.

Claim—The combination of the divided journal-box, containing two bearings, and closed by springs, G G, and the spring, I, or toothed plate, with the vibrating pinion shaft.

157. COVER FOR STOVE PLATES; J. H. Gould, Alliance, Assignor to self and E. A. Hartshorn, Mount Union, Ohio.

Claim—The self-erecting handle, in combination with weights, arranged essentially as set forth.

158. BRICK MACHINES; James A. Hamer, Reading, and Norris Maris, Kimberton, Pennsylvania.

Claim—1st, The combination of the blades and rods with the valves and spiral, arranged as set forth. 2d, The combination of the adjustable cover with spiral and trough, for the purpose of relieving or increasing the pressure upon the clay in the moulds. 3d, The combination of the hinged smoothing-piece with the hinged vertically reciprocating piece, as set forth. 4th, Providing the hinged smoothing-piece with the slot and tube, as set forth.

159. CALENDAR CLOCKS; S. P. La Due, Assignor to Thomas S. La Due, Rockford, Iowa.

Claim—1st, The arrangement and combination of the wheels and the ring, the faces of which are marked with the proper figures and letters, so that they indicate the seconds, the minutes, the hours, and the days of the week and month. 2d, Arranging the wheel in such a manner that it serves the double purpose of actuating the bell-hammer, and to indicate the hours of the day. 3d, Placing the figures and dials on the faces of the driving wheels to indicate the seconds and minutes by a continuous motion; also, to indicate the hours by a continuous or intermittent motion.

160. STRAW CUTTERS; Joseph B. Okey, Assignor to self and Wm. H. Hendrick, Indianapolis, Indiana.

Claim—1st, The combination of sliding bar, constructed as set forth, with yoke and vibrating bottom. 2d, The combination of cams with lever, constructed and used as described.

161. BREECH-LOADING FIRE ARMS; Joseph Rider, Newark, Ohio, Assignor to self and E. Remington & Sons, Ilion, New York.

Claim—The combination of the movable breech-pin and the cap tube applied to a pistol, as described. And, in combination with a hammer of the form described, I claim the arrangement of the main spring and trigger, relatively to each other, to the hammer, and to the stock and barrel, as described.

162. SEWING MACHINES; Joseph C. Silvey, New Orleans, Assignor to Thomas J. Dobyns, St. Helena Parish, Louisiana.

Claim—1st, Operating the needle-arm by means of a grooved eccentric and a pin on the needle-arm, arranged in the manner described. 2d, The construction or arrangement of the portion of the feed-plate or table through which the needle and the feeding-dog work, to form an inclined plane relatively to the direction of the movement of the feeding-dog. 3d, The combination of springs, applied in the manner described, to effect the tightening of the stitch, and otherwise control the thread between the perforating needle and its spool, by the automatic operation explained.

163. APPARATUS FOR FEEDING PEGS; Seth D. Tripp, Assignor to self and Luther Hill, Stoneham, Mass.

Claim—1st, Winding up the blank or strip of pegs with the ribbon, so that as the ribbon is wound off by the movement of the machine, the blank will be fed up in the manner set forth. 2d, Hanging the spool on a vibrating arm, so that the spool and trough may follow the motions of the swinging gate or part of the pegging machine, to which the trough is attached.

164. SCALES; Andrew Turnbull, West Meriden, Assignor to self and James B. Frary, Meriden, Connecticut.

Claim—1st, The combination of the beam lever with scoop platform attached, with the spring, rack, adjustable or fixed pinion, with index or indexes attached to its arbor, and traversing over a graduated plate or plates. 2d, Attaching or suspending loosely the rack to the beam lever, by means of a pivot, and having a spring acting on said rack in order to keep the same in gear with the pinion. 3d, Attaching the lower end of the spring to the traverse bar by means of the screw and nut, in order to regulate the tension of the spring and preserve its uniformity. 4th, In combination with the beam lever, spring, and indexes, connected with the beam lever, the stop, on the arbor, for the purposes specified.

165. CLOTHES DRYER; O. H. Waters, Baltimore, Maryland, Assignor to Alfred Hunter, Washington City, D. C.

Claim—The combination and arrangement of the adjustable grooved post, its radial arms, and box, H, with box, A, cylinder, and protector, constructed in the manner set forth.

166. LAMPS; Lewis White, Hartford, Connecticut, Assignor to self and Daniel McLaughlin, City of N. York.

Claim—The application and arrangement of the operating gears, when placed in the manner described. Also, the movable flaps, in the manner described.

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167. PLANETARIUM; Lemuel Allen, Pekin, Illinois.

Claim—The representation of the planets and their orbits suspended on a diametric rod, and capable of rotating on said rod, within a broad belt which represents the zodiac. Also, the arrangement of devices by which the earth may be adjusted to represent its relative position to the sun, and to the plane of its orbit, at any point thereof, in the manner set forth.

168. SLIDE VALVES IN STEAM ENGINES; Astley C. Ancona, Reading, Pennsylvania.

Claim—The corrugated valve seat, in combination with the cavities in the face of the valve, substantially the same as set forth.

169. GRAIN SEPARATORS; P. J. Ankney and Daniel McGreevy, New Lexington, Ohio.

Claim—1st, The oscillating hopper or trough, b, as constructed, in combination with the revolving screen, operating jointly, as described. 2d, The combination of the screen, and trough, and hopper, b, with the adjustable hopper or trough, h, and the spout, with gauge, cut-off, and valve, as described.

170. MORTISING MACHINES; W. R. Axe, Beloit, Wisconsin.

Claim—The gauge plate and slides, in combination with the reciprocating table and adjustable table, arranged in the manner set forth.

171. STEAM ENGINES; Horace Bertholet, Reading, Pennsylvania.

Claim—The peculiar arrangement of the bar in the slotted valve stem, and the connexion of the arms with the cylinder cocks.

172. CHANGEABLE STENCIL; Jonathan Bigelow, Brighton, Massachusetts.

Claim—The character plate formed at its ends, as described, whether the same be swaged at one edge or not. Also, the stencil formed by the combination of said character plates, and a frame or frames or clamps.

173. MANUFACTURE OF THIMBLES; Peter S. Bishop, Smithfield, Rhode Island.

Claim—A thimble made from plated or overlaid metal, either in the common form with fluted sides, or with sides in the form of a regular geometrical figure.

174. WASHING MACHINE; Alpheus Bissell, Berlin, Wisconsin.

Claim—The arrangement of the false bottom, cords, pulleys, platform, and cam chuck, with the frame, provided with corrugated rubbers, with rollers, and with levers, said frame being operated by means of cranks.

175. GRAIN SEPARATORS; J. L. Booth, Cuyahoga Falls, Ohio.

Claim—The inclined zigzag screens, and boxes, and troughs, having a shake motion given them, and used in connexion with the revolving fan and spout.

176. SADDLE-TREES; J. H. Boyd, Baltimore, Maryland.

Claim—The employment of the double head or gullet plates, C and D, when the front head or gullet, D, is connected to the body of the tree by means of springs, in such manner that when the straining web is attached to said head and to the back of the tree, a spring seat will be formed.

177. STEAM-PRESSURE INDICATOR OR ALARM; Samuel W. Brown, Lowell, Massachusetts.

Claim—The arrangement and combination of cylinder, rod, tube, and valve with each other, in the manner described, for indicating or giving the alarm with steam from the same or contiguous chamber.

178. SASH-FASTENER; Morgan Chittenden, Danbury, Connecticut.

Claim—The combination of a T-shaped wedge with a bolt case, having an opening corresponding thereto, whereby the two sashes are uniformly and closely secured together.

179. HYDRAULIC PRESSES; M. H. Clark, Danville, Virginia.

Claim—1st, The arrangement of the water reservoir, force-pump or pumps, main supply pipe, branches, stop-cocks, and a series of hydraulic presses, for united operation. 2d, Arranging a leather packing-ring on a disc which is divided radially into a series of parts, and fitted loosely on a conical extension of the piston, and held in contact with said extension by means of an undivided disc which is suspended loosely so as to have vertical play on a screw or head pin of the piston.

180. APPLE-PARER; Richardson T. Clark, Johnstown, New York.

Claim—The combination and arrangement of the paring-knife, lever, spring, R, cord, clutch drum, and spring, U, with shaft band, and pulleys, and wheels, and apple fork.

181. STOPPERS FOR PRESERVE CANS; V. P. Corbett, Washington City, D. C.

Claim—The arrangement of the plate, screw, conical nut, and disc, composed of two or more sections, when the same are used in connexion with an elastic band or rim.

182. APPARATUS FOR REEFING SAILS; George B. Cornish, City of New York.

Claim—Constructing the slip bands in one piece with four flanches, a a a′ a′, the spaces between a a and a′ a′ serving as slip bands, and the central space between flanches, a a′, serving as a band on which the reef pennant is wound, said flanches serving to prevent any lateral movement of the yard, and also to prevent the reef pennant from coming in contact with, and being injured by, the quarter bands.

183. STEADYING LOGS IN SAW-MILLS; Riley Doty, Cardington, Ohio.

Claim—The employment of the adjustable frames, provided with journal bearings and with rollers, the same being operated in one direction by means of the head and tail blocks, and in the other direction by means of a cord and weight, one of said frames being stationed as described, by a spring provided with a shoulder and an incline plane.

184. LAMPS; John L. Drake, Cincinnati, Ohio.

Claim—The employment or use of the disc applied to the wick tube, and used in connexion with the cap, and arranged relatively with it.

185. DERRICKS; Eugene Duchamp, St. Martinsville, Louisiana.

Claim—The combination of the toggles and right and left screw boom, when the latter has its fulcrum movable with the pulleys, in the manner described.

186. COFFEE-POTS; Oliver T. Eddy, Philadelphia, Pennsylvania.

Claim—The annular cone-shaped deflecting plate resting on the bottom of the pot, and arranged in respect to the tube and perforated plate, as set forth.

187. Electro-magnetic Steam Boiler Gauge; Moses G. Farmer, Salem, Massachusetts.

Claim—The combination of an indicator, an electric circuit or circuits, one or more circuit-breakers, with a float, in any manner substantially as described.

188. Horse Power Machines; L. R. Faught, Atlanta, Georgia.

Claim—The arrangement and combination of a stationary geared rim, movable rim, supporting bar fitted in the pinions, c c, the shaft, G G, provided with pinions, F F, and wheels, and the shaft, F′, as set forth.

189. Method of Operating Crozing Knives; George Finn, Oswego, New York.

Claim—Arranging the cam that works the cutter on the bevel-wheel, so that it will not occupy more space on the arm that carries them than that occupied by said bevel-wheel, for the purpose of simplifying the mechanism and economizing space on said arm, which is necessarily limited in length.

190. Railroad Car Seats; Eli Wheeler, Elmira, New York.

Claim—1st, The arrangement of box-formed supports, cushions, and cushioned seat backs of a pair of car seats, in the manner specified, whereby when the bottoms of the seats are turned over, to fill up the space between the seats, the bed-clothing contained in the box will be exposed so as to be readily removed, and then, when the backs are turned down to fill the place occupied by the bottoms, the said boxes will be closed up and a continuous bed formed from one back edge to the other of the seat. 2d, The short open stationary partitions, in combination with sliding-panels, which, when elevated, serve as head and foot-boards, and allow ventilation under and above the berth during night time, and when lowered during the day time, afford more room to the upper portion of the body of passengers, as they pass through the aisle of the car. 3d, The short sliding-closed blinds, arranged to operate as described, and serve as foot and head-boards, and allowing ventilation above and below the upper berth, in combination with the upper berths and partitions.

191. Furnace and Apparatus for Treating Pyritous Ores; John Fretz, Angel, California.

Claim—1st, The hollow stationary cylinder, its revolving worm, and its openings, for the admission of the pyrites, and the introduction of air and discharge of the fumes of sulphur, in combination with the rotating cylinder and its internal ribs, the said stationary and rotating cylinders communicating with each other through a pipe, arranged in respect to the furnace, as set forth. 2d, The system of vertical boxes or chambers communicating with each other, with the steam pipes, the rotating cylinder, and the exit pipe.

192. Machinery for Warping Yarn; Richard Garsed and Clayton Denn, Philadelphia, Pennsylvania.

Claim—1st, The form of the drop wires, arranged in the manner specified. 2d, The cylinder, for the purpose of marking the cuts. 3d, The employment of a register, constructed as specified, for the purpose of registering the number of cuts while the machine is in motion. 4th, The employment of the bar for the purpose of taking the leas, constructed with fingers either on one or both sides. 5th, The combination of the vibrating tube, the stationary hook, the movable hook, and the pin, for the purpose of forming the yarn into links, constructed in the manner described.

193. Churn; Samuel Gissinger, Alleghany, Pennsylvania.

Claim—The arrangement in the movable frame of the oscillating churns, furnished with dashers and wings, in combination with the revolving shaft armed with wings, arranged as described.

194. Galvanic Battery; Eugene Grenet, Jr., Paris, France.

Claim—1st, The method of agitating the exciting liquid of a galvanic battery by forcing a current of air through it, in the manner set forth. 2d, Arranging and constructing the zinc and charcoal elements, in combination with the exciting fluid, in the manner described, whereby they may be operated, the one by the other. 3d, Forming the charcoal elements by pressing into or on to the surface of plates of lead, when yet in a semi-liquid state, small pieces of charcoal, in the manner described.

195. Gauge and Box for Casting Journals in Soft Metals; C. W. Griffith, Dayton, Ohio.

Claim—In combination with a hollow box, a loose removable gauge or centering plate, fitted and fastened to, or held against the box, so as to hold the shaft in its proper position in the box, and at the same time retain or prevent the melted metal that is poured into the hollow box, to form a box around the shaft, from running out.

196. Apparatus for Cooling Liquids; Valentine Hall, City of New York.

Claim—The employment or use of one or more receivers placed within a tank, and connected with the barrel or cask by means of a siphon, and with a pump within or at the outer side of the tank, for the purpose set forth. Also, combining a pump with one or more receivers, connected together and made to communicate with each other by siphons, when said parts are submerged within a tank, and made to communicate with a cask or barrel, by means of a siphon extending over the top of the tank.

197. Lamps; Halvor Halvorson, Cambridge, Massachusetts.

Claim—1st, The employment or use of the valve in connexion with the wick tubes, for the purpose of regulating the supply of air to the interior of, or between two planes of the wick. 2d, The arrangement of the shaft and their wheels, so that the wheels on one shaft may gear into those on the other, for the purpose of raising and lowering the wicks simultaneously by the turning of one shaft.

198. Trolling-bait for Catching Fish; Riley Haskell, Painesville, Ohio.

Claim—1st, Constructing the body of an artificial representation of a natural fish in two detached parts, to be used in combination—one portion thereof revolving, and the other remaining fixed or stationary, both portions being on one shaft. 2d, In connexion with my first claim, filling the upper part of said fixed portion with a light substance, and weighting the lower part thereof, for the purpose of keeping the said fixed portion vertical in the water.

199. Tailors' Shears; Rochus Heinsich, Newark, New Jersey.

Claim—Constructing the lower bow with its upper portion widened, and with the projection thereon, so as to form a bearing for the fore-finger within the bow.

200. Variable Exhaust for Steam Engines; W. M. Hurlbert, Northfield, Vermont.

Claim—Applying the slides to operate in elbows or inverted L-shaped nozzles, arranged as described.

[This invention consists in making the upper ends or nozzles of the blast pipes each in the form of an elbow or the inverted letter L, and fitting the regulating slides to the horizontal portions of the elbows, so that both can be adjusted simultaneously by right and left-handed screws on the same shaft, thereby providing very conveniently for the variation of the area of the openings.]

201. STEAM-TRAP; E. T. Jenkins and F. B. Polley, Williamsburgh, New York.

Claim—The round pipe, in combination with the valve seat, valve, ring, opening, and float, arranged in the manner described.

202. BOILERS; Christian Kieffer, Lancaster, Pennsylvania.

Claim—The construction of the extension and perforated steam-pipe, with the extension hot air flue, with the pan, with pipes, I I, and perforated pipe, K, arranged as described.

203. BUNG-HOLE BORER AND REAMER; Josiah Kirby, Cincinnati, Ohio.

Claim—The conical-shaped stock, when made with a throat cut through from the edge of the bit on one side, to the opposite side of the stock, so that the shavings are made to pass through the stock and out on the opposite side. Also, the combination of the auger bit with reamer, made in the manner described.

204. SEED PLANTERS; Levi L. Lancaster, Rocky Mount, North Carolina.

Claim—The frame, wheels, hopper, cylinder, pockets or depressions, carrying tube, furrow-opener, coulter, leveler, and bottom, arranged as described.

205. THERMOMETRIC REGULATOR FOR HEATING APPARATUS; Lewis W. Leeds and Calvert Vaux, City of New York.

Claim—So applying the vessel, which we have termed the secondary heater, containing the fluid to act upon the piston, or its equivalent, in combination with the primary heater, and so applying the piston, or its equivalent. in combination with said secondary heater and with the regulating valve, that the secondary heater is exposed at the same time to the heating influence of the primary heater and the cooling influence of the incoming cold air, and the fluid contained therein is, by its expansion and contraction, made to control the admission of the steam or other heating agent, and cause the supply of such agent to the heater to vary inversely with variations in the atmospheric temperature.

206. APPROACH-OPENING GATE; Julius S. Lloyd, Philadelphia, Pennsylvania.

Claim—Operating the angular bar by means of the carriage, with its pulleys and guard, in combination with the projecting arm of the rod, and the cranked and weighted rods, and the respective cords or chains, arranged as set forth.

207. WATER INDICATOR FOR STEAM BOILERS; George Lutz, Logan, Ohio.

Claim—1st, Operating auricular and visual alarms, either severally or conjointly, at will, by mechanism such as is described. 2d, The combined index and tripping levers, arranged in the manner set forth. 3d, The combination of the tripping levers, balance lever, and bifurcated rocking lever, as described. 4th, The combination of the catch and dogs, arranged as set forth. 5th, The combination of the bent lever, thumbscrew, and slotted bracket, as described.

208. METHOD OF MAKING SOAP; Augustus Miller, Grafton, Ohio.

Claim—Soap manufactured from the herein-named ingredients and chemicals, when the same are compounded in the manner specified.

209. IRON SPOONS; G. I. Mix, Wallingford, Connecticut.

Claim—1st, The method, substantially as described, of making the handles of iron spoons. 2d, Forming a tongue upon the bowl blank, and a corresponding recess or inlet upon the handle, or vice-versa.

210. CARPET-FASTENER; George G. Noyes, Worcester, Massachusetts.

Claim—The bar, provided with the hooks, knife-edge, and spurs, so that it may be readily secured to, and detached from, the base-board and floor.

211. RAILROAD CHAIRS; W. A. Nugent, Susquehanna Depot, Pennsylvania.

Claim—The shell or body with the cam jars and the chair, arranged as specified.

212. HORIZONTAL WATER-WHEEL; John K. O'Neil, Kingston, New York.

Claim—The arrangement of the guide partitions, cylinders, wheels, and wheels or buckets, in the manner specified.

213. COMPOSITION FOR TANNING; Thomas S. Page, Milan, Ohio.

Claim—A liquor composed of terra japonica, sulphate of alumina and potassa, muriate of soda, nitrate of potash, and sulphate of soda, when combined in the proportions described.

214. BORING AND MORTISING MACHINE; Collin G. Pollock, Cincinnati, Ohio.

Claim—The arrangement and combination of the bar on the arbor, projection on the upright lever, connected with the arbor by the knuckle-joint, and the bevel gear, for joint operation.

215. FEEDING PAPER TO AND FROM PRINTING PRESSES; Charles Potter, Jr., and C. B. Cottrell, Westerly, Rhode Island.

Claim—The securing of the registering points firmly to a fixed portion of the machine, and releasing the paper therefrom at the proper time by elevating the adjacent surface. Also, depositing each sheet face upwards on the pile, by carrying it between a vibrating series of tapes, operated in the manner set forth. Also, the arrangement of the cylinders and the series of tapes, or their respective equivalents, in the vibrating frame, which vibrates on the shaft as a centre, and receives its proper vibratory motion from the hook, or its equivalent, whereby the frame may be readily unhooked and swung out of the way to allow access to the bed of the press without deranging or disturbing any of the mechanism.

216. BURNERS FOR VAPOR LAMPS; William H. Racey, City of New York.

Claim—The burner and curved rods, one or more, in combination with one or more deflecting caps and draft tube, arranged as set forth.

217. INSECT POWDER-BLOWER; Peter Reynard, City of New York, and Victor Varin, Brooklyn, New York.

Claim—The divisions in the powder-chamber to insure the powder being in a position to be acted on by the air blown through the perforated diaphragm. And in combination with said powder-chamber, we claim the india rubber perforated ball, fitted and acting to give the blast of air.

218. THRESHING MACHINES; Joshua Rollman, Sinking Springs, Pennsylvania.

Claim—The application to a threshing machine of one or more independent fan-blowers, which are attached outside of the machine, and in such position as to prevent any dust, arising from the operation of threshing, from reaching the attendant on the machine, arranged in the manner described.

219. HORSE POWER MACHINES; Gelston Sanford, Poughkeepsie, New York.

Claim—1st, The combination of the internal toothed wheels and their connected pinions with the hollow standard, arranged in the manner set forth. 2d, The combination of the hollow standard with the shaft and its connected gearing, in the manner described. 3d, The combination of the adjustable bearing or frame with the hollow standard and shaft.

220. TOPS FOR TABLES; Nathan Sargent, Charlestown, Massachusetts.

Claim—A panoramic table or table-top, constructed in the manner set forth. Also, the peculiar mechanism whereby the canvass or panoramic cloth is maintained with proper tension upon each of the rollers, however such cloth may vary in thickness or in number of folds upon such rollers.

221. STRAW-CUTTERS; Casper Schultze and J. Frederick Schrœder, Covington, Kentucky.

Claim—A cutting box, constructed with adjustable compound knife-wheel, in combination with feeding chute, arranged as described.

222. MACHINE FOR MAKING SEWING MACHINE NEEDLES; Wm. W. Shipman, New Haven, Connecticut.

Claim—The feeding plier formed by the lever and block, in combination with the punching die, P2, and die, P3 and 21 31, the cutter and clamp formed by J J and I I, the whole in combination as set forth.

223. ELECTRICAL HEATING APPARATUS; George B. Simpson, Washington City, D. C.

Claim—The insulation of the metallic coil or helical electrode, which I call an electro-heater, and the successful generation of heat by passing currents of electricity over a coil or coils of platina, or other metallic wires resting on, and supported by, a non-conducting electrical base, or encased in metallic tubes, or open vessels insulated with any of well known substances non-conducting of electricity, as described.

224. MODE OF CONSTRUCTING MATRICES, &c.; John Joseph Charles Smith, Covington, Kentucky.

Claim—The discovery of rendering composition or alloy of copper and tin pliable, and in such a state as to admit of an easy impression of any figure or design on or in metal, whether engraved or produced by means of electrotyping, as a copy of any figure, design, or object, thus yielding a perfect matrix or mould—and this process I further claim, as my invention, in connexion with the manufacturing of types of the alloy of copper and tin, as already described, and which will and shall produce the intended effect.

225. MAKING LIGHTNING CONDUCTORS; Charles Stearns, Lowell, Massachusetts.

Claim—The twisting rollers, constructed as described, in combination with the corrugating rollers, for producing the corrugated twisted copper rod.

226. HORSE-RAKES; Theodore J. Steffe, Lancaster, Pennsylvania.

Claim—The arrangement and combination of the teeth heads, key, spiral spring attachment, lifters, lever, cleaners, when these several parts have their centre of motion on the axle of the machine. Also, in combination with the above, the foot-brace, hinged at slide and slot, as specified.

227. HOMINY MILLS; George Strause, Boonsboro', Maryland.

Claim—Giving to the shaft substantially the shape represented, when the said shaft is armed with toothed segments, and is also operated within a tube which is also armed with counteracting segments.

228. BRIDGES; David H. Van Duzer, Sugar Loaf, New York.

Claim—In combination with the blocks, E F G H I, rods, blocks, C C′, and bolts, arranged as shown, the arrangement of the plates, as described.

229. TAKE-UP FOR TRIMMING LOOMS; Samuel Walker, Roxbury, Massachusetts.

Claim—Giving to the take-up roll of a trimming loom a reciprocating motion longitudinally on its axis, for the purpose specified.

230. PHOTOGRAPHIC PRINTING MACHINE; Charles Fontayne, Cincinnati, Ohio.

Claim—1st, The described machine for printing or multiplying photographic pictures. 2d, The described art of multiplying positive photographic pictures or expressions from the same negative upon the same sheet of sensitive paper, or other material. 3d, Causing the sensitive material used for the reception of photographic impressions, latent or otherwise, made by the agency of solar or other light, passing through a negative, to traverse the aperture or negative employed. 4th, The traversing bed, whether cylindrical or plane, confined within a dark chamber, whose surface may be moved by ratchets, screws, cranks, or their equivalents, for the purpose of carrying the sensitive material when the same is used in connexion with a negative, from which it receives positive impressions. 5th, The employment of continuous sliding or revolving discs, with springs and spring-stops, or their equivalents, to give them a uniform motion and overcome the momentum or rebound, for admitting and shutting off light uniformly to and from all parts of the surface to be acted upon in printing positive photographic pictures from a negative. 6th, The application of a lens or lenses for the purpose of condensing light, when used in combination with negative 28, the sensitive material, and slide or cut-off, for admitting or shutting off light, for the purpose of photographic printing. 7th, The combination of condensing lens, 33, negative, 34, daguerreotype tube, 75, with its lenses, 76, the sensitive material and slide or cut-off for photographic printing. 8th. The combination of the sensitive material, negative, 28 (as destinguished from negative, 34), and slide or cut-off, for the purpose of photographic printing. 9th, The method of raising the glass negative or other matrix, 28, from the sensitive material, to permit the motion of the latter, and the method of lowering again. 10th, The method of supporting and adjusting negative, 28, as described. 11th, The use of the glass negative (when negative 28 is used), or the use of a piece of plain glass in the place of it (when negative 34 is used), or the use of a skeleton frame, for the purpose of pressing the sensitive material smoothly and evenly on roller 5, or traversing bed, while the photographic impression is being made. 12th, The alternate admission and exclusion of light passing through a negative, to act upon a traversing sensitive material, confined in a portable dark chamber. 13th, The rod, 8, working through hollow slotted shaft, 6, and affixed to roller, 5, by plate, 9, for the purpose described. 14th, The combination of the lever, 12, with its spring-catch, 13, with the ratchet wheel, 14, nose, 82, of shield, 15, and slotted stop, 11.

231. CUT-OFF GEAR FOR STEAM ENGINES; Henry Whittington, Philadelphia, Pennsylvania.

Claim—The inclined spiral edges on the revolving and sliding sleeve, when the latter is applied to operate the cut-off valve, the descent of which is caused by the pressure of steam above the valve, and when the inclined edges serve to retard the descent of the valve.

232. WASHING MACHINE; Asbury Wilkinson, Madison, Indiana.

Claim—The combination of circular boards suspended from a frame above by springs, with a rotary corrugated roller working between them, constructed as set forth.

233. REGISTERING APPARATUS; Jephtha Avery Wilkinson, Brooklyn, New York.

Claim—A series of counting discs standing at right angles, or nearly so, to each other, and each formed with a thread or worm around its periphery taking teeth on the next counting disc, in the manner specified. Also, the arrangement of the counting disc, p9 and p10, in the manner specified, whereby they can be disconnected and set to commence counting when required.

234. TRY-COCK FOR STEAM BOILERS; John F. Cook, Assignor to self and George F. Page, Baltimore, Md.

Claim—Combining with the barrel of a try-cock a two-armed lever, one provided with springs or weights, and the other with a rubber (or other equivalent disc), so that the weighted arm shall hold the valved or disc arm against the bore of the barrel of the cock, as described.

235. RAILROAD CHAIRS; Henry W. Gray, Cleveland, Ohio, Assignor to self and W. H. Alvord, Homer, N. Y.

Claim—The forming the railroad chair in two sections, having the outer surfaces convex, in combination with the gripe and beam, arranged in the manner set forth.

236. PRESSES; Horatio Francis Hicks, Assignor to Hicks Brothers, Grand View, Indiana.

Claim—The combination of stepped bearings, with rollers adapted to operate in connexion therewith, without endwise pressure or tendency to displacement, in the manner set forth.

237. DEEP SEA SOUNDING APPARATUS; George W. McCord, Assignor to self and J. F. Lobdell, Centralia, Ill., and V. N. Davis, Rush, New York.

Claim—The arrangement of the cylinder, piston, graduated scale, cap, and vernier or register, constructed as described, for the registration of marine soundings upon the principle of hydraulic pressure.

238. MACHINE FOR SHAPING AND FINISHING THE BACKS OF BOOKS; G. H. Sanborn, Boston, Mass., and John E. Coffin, Portland, Maine, Assignors to G. H. Sanborn, aforesaid.

Claim—1st, The employment, for shaping or finishing the backs of books, of a divided roll or pair of segments, operating across the backs from the centre to both sides thereof. 2d, The combination of the cam, T, slide, toggle, P P, spring, link, y, lever, link, u, and toggles, F F, with the book-holder, for the purpose of raising the holder and causing it to close upon the book before each operation of the divided roll or pair of segments. 3d, Attaching the segment levers, G G′, or their equivalents, to levers, H H, operated by cams, N N, on the constantly revolving main shaft, for the purpose of throwing the segments out of the way of the holder, at the proper stage of the operation of the machine, to permit the removal and introduction of the books.

239. STOVES; Thomas Shaw, Assignor to self and J. C. Bailey, Philadelphia, Pennsylvania.

Claim—1st, The adjustable legs, when combined with the casing and its gauge cylinder, and arranged so as to serve the double purpose of tilting the stove more or less on one side, and regulating the admission of air into the casing. 2d, Operating the valve for regulating the flow of gas into the casing, by means of the object to be heated by the flame, in conjunction with the devices set forth, or their equivalents.

240. CONVERTING RECIPROCATING INTO ROTARY MOTION; A. T. Underhill, City of New York, Assignor to C. R. Underhill, New Castle, New York.

Claim—The arrangement and combination of the frame, guards, and ratchet wheels, so that the rotation of the shaft may be reversed, as set forth.

241. MACHINERY FOR PERFORATING HAT BODIES; Wm. F. Warburton and Wm. B. Atkin, Assignors to Wm. F. Warburton, aforesaid, Philadelphia, Pennsylvania.

Claim—1st, The system of pointed pins, hung independently of each other to the cross-head, furnished each with a separate spring, and arranged in combination with the hat block attached to the face plate on the spindle. 2d, The ratchet wheel of the same form, or thereabouts, as that presented by a transverse section of the hat to be perforated, in combination with the face plate and its hat block, the said wheel being operated by the pawl and the appliances connected therewith, or their equivalents, in the manner set forth.

242. MODE OF DISTILLING LIQUIDS FROM COAL TAR; Morris L. Keen, Rogers' Ford, Pennsylvania.

Claim—The application of additional heat at or near the surface of the coal tar, or other similar hydrocarbon, when used in combination with pressure in the boiler, for the purpose of preventing the tarry foam from rising and over-running the still, and thus endangering the operator as well as the premises.

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243. CHURN; Abel Austin, Altona, Illinois.

Claim—The arrangement of the shaft, cranks, dashers, handles, links, springs, c c c, box, spring, g, and lid, constructed as described.

244. ROTARY BLOWER; Wm. B. Barnard and Edmund Jordan, Waterbury, Connecticut.

Claim—The diaphragm, in combination with the revolving propeller or propellers to deflect the blast to the mouth or opening, as the blower revolves in the case.

245. CAMP STOOL; Elbridge G. Belknap, Philadelphia, Pennsylvania.

Claim—The combination of the case and the seat frame with the swivel blocks, braces, and connecting rod, arranged in the manner described.

246. SEED PLANTERS; Lewis Reese Carpenter, Lancaster, Ohio.

Claim—The arrangement of the beam, handles, braces, furrowing scraper, and seed box, with the planting slide, lever, wheel, and covering scrapers, constructed as described.

247. MACHINES FOR PREPARING TOBACCO FOR PRESSING; Edwin S. Collin and Thomas N. Read, Aspen Wall, Virginia.

Claim—The arrangement of two, three, or more pairs of progressive pressure rollers with each other, in the manner set forth. Also, combining a series of oil vessels and oiling pads with the aforesaid pairs of pressure rollers, in the manner set forth.

248. MACHINES FOR SPLITTING WELTS; John Critcherson, and Eri S. Moulton, Boston, Massachusetts.

Claim—The beveled grooves, arranged in reference to each other, on the cylinders, and operating in combination with the adjustable cutter, as set forth.

249. HARVESTERS; Tobias Crumling, Hellam, Pennsylvania.

Claim—The arrangement and combination of the independent platform with the frame, belt, and driving axle.

250. Reels for Harvesters; George S. Curtis, Chicago, Illinois.

Claim—The employment of sliding heads, and pivoted arms, and bars, in combination with the reel shaft and beaters, described so that the diameter of the reel can be expanded or contracted.

251. Harvesters; Jacob D. Custer, Norristown, Pennsylvania.

Claim—1st, The main shoe, constructed in the manner described, in combination with bars of main frame and supporting bar, in the manner described 2d, The caster wheel, in combination with the lever and adjustable plate, arranged in the manner described.

252. Telegraphic Cable; J. S. Davison, Cranberry, New Jersey.

Claim—Arranging a series of loose metal strips in a coil, or its equivalent, as described.

253. Bedstead; Eben Eaton, Cincinnati, Ohio.

Claim—The construction of bed-posts with the wedge-formed part and the square piece attached, so as to form a shoulder to receive the rail, in combination with the bottom or platform of a bedstead, with the rail formed so as to fit the posts described, and all permanently connected together by means of cross-pieces.

254. Mode of Coloring Woolen Hats; G. D. Foote, Danbury, Connecticut.

Claim—The described process of restoring the color of the hats after they have been dipped in the stiffening and rubbed off by sand paper, by applying the hot dyeing liquid.

255. Rolling Mills; John and George Fritz, Johnstown, Pennsylvania.

Claim—The application to each of the pairs of drawing or forming rolls of a feed roll, such as described, and driven by gearing or other machinery, and turning in the same direction with said drawing or forming rolls, for the purpose of carrying and feeding into them the pile or bar of heavy iron.

256. Apparatus for Washing Gas; Harvey Guild, New Orleans, Louisiana.

Claim—The arrangement of the water-pipe and rose within the inlet pipe of the wash-box, in combination with the perforated plate or diaphragm, at the junction of the inlet pipe, with the wash-box.

257. Belt-hook, Pliers, and Punch; N. E. Hale, Nashua, New Hampshire.

Claim—1st, The combination of the roughened surfaces with the triangular wedge end, arranged in relation to each other, as set forth. 2d, The combination of the jaws with the punch, roughened surfaces, and wedge end, constructed as set forth.

258. Method of Distilling Oil from Coal; John Howarth, Salem, Massachusetts.

Claim—Forming oleaginous vapor from coal, or other substances, yielding pyrogenous oils, by passing through the material to be acted upon, a current of superheated steam, in combination with steam direct from the boiler, in the manner set forth. Also, forming oleaginous vapors from coal, or other substances, yielding pyrogenous oils, by passing through the material to be acted upon, air combined with superheated steam, in the manner set forth.

259. Bedstead Slats; Tyler Howe, Cambridgeport, Massachusetts.

Claim—The described bed slat, consisting of the lifter, in combination with the slat, constructed in the manner set forth. Also, the construction in the ends of slats, by which they are connected with the bedstead or springs, as described.

260. Mode of Arranging Couches in Railroad Cars; Edward C. Knight, Philadelphia, Pennsylvania.

Claim—The arrangement of couches in railroad cars by means of the double-hinged rod, constructed in such a manner that the couch, when not in use, may be folded up against the ceiling and retained there by means of a button, or other suitable device.

261. Screw-wrench; W. Kuhlenschmidt, City of New York.

Claim—The arrangement and combination of the conical disc with the helical groove, the spring, the movable jaw, and the shank, to operate as set forth.

262. Moulding Water-traps; James Allen Lowe, City of New York.

Claim—The application of a metallic core, constructed and operating as described, to cast water-traps.

263. Cooking Stoves; James L. Meafoy, Middleton, New York.

Claim—The cylindrical fire chamber and air chamber, communicating with the fire chamber and the heater chamber, arranged relatively with each other and the oven, for the purpose set forth. Also, in combination with the fire chamber, air chamber, and heater chamber, arranged as shown, the perforated plate placed in the flue relatively with the fire chamber.

264. Machines for Distributing Fertilizers; Z. N. Morrel, Cameron, Texas.

Claim—The combined arrangement of the single side-wheel, distributing wheel, regulating slide, revolving arms, boot, set-screw, shares, cog-wheels, draft rod, sprocket wheels, roller, and chain, in the manner set forth.

265. Process of Distilling Oils from Coke; George Mowbray, Green Point, New York.

Claim—In the manufacture of coal oils and other pyrogenous oils, by exposing the coal, or other materials, to the products of combustion generated in a separate furnace. I claim igniting said products of combustion, previous to admitting the same into the distilling kiln, by admixture of a sufficient proportion of air, to burn the oxide of carbon into carbonic acid.

266. Writing-tablet; George Munger, New Haven, Connecticut.

Claim—An argillaceous surface wood writing-slate, which is formed by uniting several layers of veneering or thin wood together, so that their grains run antagonistic to one another, and then coating the exterior surfaces of the compact mass with a composition of slate, emery, or other similar argillaceous material.

267. Bed-spring; S. D. Newbro', Lansing, Michigan.

Claim—The employment of the oblong plates, whether made of wood or of metal, or any other suitable material, when the same are secured together, as set forth.

268. Manufacture of Wire Cloth; Rufus Nutting, Randolph, Vermont.

Claim—Compressing wire cloth by passing it between rollers suitably constructed, or by equivalent means, whereby its surfaces are rendered smooth and even, in the manner specified.

269. Stoves; Oscar Paddock, Watertown, New York.

Claim—The damper arranged over the pipe through which a direct communication between the fire-place

and the chimney is effected and operated by means of a rod, or its equivalent, which is secured to the door, and which acts against a forked lever, as specified.

270. Manufacture of Hoes; Andrew Patterson, Birmingham, Pennsylvania.

Claim—Forming the head or eye of a hoe and attaching it to the blade at the same time, by pouring the molten metal to form the head on or around the blade.

271. Construction of Packing-boxes; Edward L. Perkins, Roxbury, Massachusetts.

Claim—1st, Forming the sides, ends, bottom, and top of the box with, or attaching thereto, the right angular shaped braces or shoulders formed with beveled corners, so as to make a close and binding joint. 2d, In combination with the above, I claim the cover formed in two wedge-shaped pieces, or in any manner substantially similar, whereby all the parts constituting the box are drawn and held rigidly together.

272. Muffs; Jane Phillips, City of New York.

Claim—A muff, arranged with a cut in its side covering or shell, an annular space or pocket, and a porte-monnaie secured in its inner part.

273. Hoops of Skeleton Skirts; Joseph F. Pond, Cleveland, Ohio.

Claim—The combination of the eye on one extremity of the hoop, with the series of set-offs on the other, constructed as set forth.

274. Securing Iron Bands on Cotton Bales; C. W. Pyle, Galveston, Texas.

Claim—A plate, constructed with a short open slot, a long closed slot, and a turned down lip or flanch.

275. Spring Hinge; Cornelius J. Rooney and David Renshaw, City of New York.

Claim—The arrangement of the coiled spring, shaft, and wings, in combination with each other, for the purposes stated.

276. Burglars' Alarm; Abbott Q. Ross, Cincinnati, Ohio.

Claim—Connecting the doors or windows of a house to an alarm mechanism, through a system of strained wires, so that the forcing of a door, or the cutting of any wire shall let off the alarm mechanism. Also, connecting the panels of a door with the strained wires that unite the door with the alarm mechanism, as that the cutting out of a panel, or the cutting of one of the wires, shall let off the alarm mechanism. Also, the combination of the swinging lever on the door, with the bolt and its inclined plane that locks the spring drum, for the purpose of putting said door in connexion with the alarm mechanism, when said door is drawn to, and shut from the outside.

277. Horse Harnesses; John Rouse, Port Gibson, New York.

Claim—The double-eyed hook, arranged as described in the yoke ring, so as not to be withdrawn therefrom, in combination with said ring and with the divided hame straps, which are respectively secured to the opposite eyes of the hook.

278. Steam Punching Machine; John Sparrow, Portland, Maine.

Claim—The employment of a single-acting cylinder and piston, operated by the pressure of steam, water, or other fluid, and a toggle, arranged relatively to each other and the punch or cutter, as described.

279. Method of Operating Independent Second Hands of Stop-watches; Peter M. Satzell, Philadelphia, Pennsylvania.

Claim—1st, The independent second hand adapted to a watch, so that by means of the devices described, or their equivalents, the said hand may be connected to, or disconnected from, the time train of the watch, without interfering with the movements of the latter. 2d, The stop-arm, with its forked end so adapted to the hollow arbor as to serve the purpose of stopping and releasing the said arbor, and at the same time serving to maintain it in its proper vertical position. 3d, The wheel with the springs, in combination with the hollow arbor of the independent seconds hand, the wheel being hung loosely to, and the spring bearing against, the said arbor.

280. Safety Envelope; William J. Stetson, Baltimore, Maryland.

Claim—The mode of giving security to letter, and other envelopes, the same consisting in water-proofing that part of the envelope upon which the adhesive material is applied.

281. Construction of Gas Burners; John Stevens and John Johnson, City of New York.

Claim—The apertures, in combination with the movable slide, or its equivalent, whereby the area of the passage for the gas or vapor is contracted at pleasure at the point of its exit in the atmosphere, and the volume of the flame diminished, without substantially changing its character. Also, the arrangement of the branches, diverging from a single pipe, and pressing by their elasticity against the opposite side of the slide, for the purposes explained.

282. Chamber Utensil; J. C. Stoddard, Worcester, Massachusetts.

Claim—A chamber vessel provided with a flanch and elastic ring, made as described, so as to form a tight joint, and also to prevent noise.

283. Machines for Scouring and Hulling Buckwheat; Joseph N. Treadwell, Redding, Connecticut.

Claim—The arrangement of the revolving and graduated screws with the hoppers, conveyors, blasts, and conductors, in the manner described.

284. Smut Machines; Richard Ward, Edinburgh, Indiana.

Claim—The employment of the corrugated iron plate, having the horse-shoe perforations, in combination with the iron plate having the diamond perforations, in the construction of a perforated scouring and separating cylinder, arranged to operate as set forth.

285. Seed Planters; S. J. Wasterburg, Altona, Illinois.

Claim—The arrangement of the block provided with chambers, c, and chambers b, with the rods, shaft handle, hopper, spring, i, slides, and spring, g, as set forth.

286. Stoves; C. L. Whitney and Samuel Reed, Geneseo, Illinois.

Claim—1st, The arrangement of deflecting plate, chamber, graduating damper, and flue-pipes, in the four corners of the oven, all in combination for the purposes set forth. 2d, In combination with this, we claim the use of pipes of clay, or other similar material, arranged in the manner set forth.

287. Abdominal Supporter; A. B. Weaver, Carthage, Indiana.

Claim—The employment of the hip bands and centre hip straps, in combination with the straps, arranged as set forth.

288. Method of Raising Water by Animal Power; Zatter F. Wilder, Painted Post, New York.

Claim—The arrangement of a series of platforms, in combination with a pump, so that a series or a succession of strokes of the pump piston shall be produced before the cattle arrive at the drinking trough.

289. Hand Punch; Reuben Wood, Grand Ledge, Michigan.

Claim—1st, The peculiar relative arrangement of the two series of inclined planes, in the contact faces of the circular plates, to be used either with or without interposed balls or rollers, in the manner specified. 2d, The use of the slotted tube, in combination with the two inclined ways and cross-bar (with or without the rollers), for the purpose of extricating and lifting a punch, or other tool, in the bar, by a reversed motion of the lever.

290. Cotton Gins; John Wilson, Anderson C. H., South Carolina.

Claim—1st, The employment of three or more toothed or serrated cylinders, arranged and disposed so as to operate as set forth. 2d, In connexion with the cylinders thus arranged and disposed, the rotating stripping brushes and adjustable plug or register, to ensure respectively the proper discharge of the lint and the seed.

291. Manufacture of Sheet Metal; Henry W. Wimshurst, Dalton, England.

Claim—The improvement in the manufacture or production of sheet metal or metal foil, by cutting the same from a block or solid mass, by means of a cutting mechanism, in lieu of rolling or beating the same by means of rolling or beating mechanism, as has heretofore been done.

292. Door Spring; O. D. Barrett, Assignor to self and J. F. Keeler, Cleveland, Ohio.

Claim—The levers, in combination with the connecting rod and the springs, constructed as specified.

293. Stave Machine; James Decker, Assignor to self and A. P. McRae, Reidsville, Georgia.

Claim—The combination and arrangement of the convex and concave cutters, bed-piece, tonguing and grooving cutters in the heads, and the cam, attached to the pressure hub or roller, and lever connected with the said cam, and the shaft of cutter head, as set forth.

294. Manufacture of Cigar-wrappers; Francis Dixon, Lynn, Assignor to self and Moses Sweetzer, Newburyport, Massachusetts.

Claim—A new article of manufacture, the same consisting of tobacco leaf reduced to pulp, and converted subsequently into sheets, or other desirable form suitable for use, or in the making of cigar-wrappers.

295. Machine for Shaping Heels for Boots and Shoes; Luther Hall, Assignor to self and S. S. Hemenway, Boston, Massachusetts.

Claim—The combination of the stationary bed-plate, the movable cutter-carriage, provided with self-adjusting cutters and carriers, adjustable clamps, a guide friction wheel, and a curved rack and pinion, arranged as set forth. Also, combining with the adjustable clamps an adjustable holder and former, so constructed and arranged as not only to co-operate with the clamp in maintaining the heel of the boot or shoe firmly in position but to serve as a pattern, to give the heel any desirable contour on its bearing surface. Also, the peculiar construction of the secondary cutter carriage set forth, and the arrangement of the secondary cutter with respect to the primary cutter, the guide friction wheel, and the heel-tread former, whereby the secondary cutter is rendered capable of giving to the lower or bearing surface of the heel any form that may be desired.

296. Bungs of Casks; John Keane, Assignor to self and Andrew McLean Wood, City of New York.

Claim—Providing a bung or spigot, with reservoir for spirit, and a system of pipes or passages, or their equivalents, so arranged as to cause all the air entering the cask to pass through the spirit in said reservoir. And in combination with such a reservoir and system of pipes or passages, or their equivalents, I claim a valve, applied to the bung or spigot.

297. Portable Gas-holder; James McFarlan, Assignor to James McFarlan, Jr., and E. McFarlan, Brooklyn, New York.

Claim—The construction of the gasometer, with its upper portion of conical form, with flexible sides and with a stiff head, and of such size that it may be introverted within the stationary tank-like portion to which its flexible sides are attached.

298. Grain Separators; Jefferson Nash, Janesville, Assignor to Alonzo K. Cutts, Fulton, Wisconsin.

Claim—The arrangement and combination of the vibrating lever, the elbow crank, and the rods, whereby the motion of the shoe can be changed from a longitudinal to a transverse direction, and vice-versa.

299. Making Gas from Wood; August Schmidt, Assignor to self, Charles, Edward, and Herman Schmidt, City of New York.

Claim—The arrangement of the arch-shaped retort and narrow flues with the arch of the retort, in the manner specified.

300. Making Gas from Rosin; August Schmidt, Assignor to self, Charles, Edward, and Herman Schmidt, City of New York.

Claim—The retorts and its flues, combined with the receptacle or kettle, and arranged in the manner specified.

301. Apparatus for the Production Hare's Hydro-oxygen Light; George Hand Smith, Assignor to S. O. Smith, Rochester, New York.

Claim—1st, The use of carbureted hydrogen of gas, in combination with the atmospheric air or oxygen gas, in proportions desired, operating under condensation through a proper regulator, and discharging through jets of minute orifice upon, and rendering incandescent any proper radiating material of any form, being independent of any atmospheric circumstances or situation, in the manner and through the means and machinery. 2d, The arrangement of four jets or burners for directing the impact of gases on incandescent surfaces, such burners having minute orifices pointing to a common centre, three of them placed so that their orifices of discharge shall be within, or nearly within, one quarter of the circumference of a circle drawn through them from the centre to which they point (being not more than one-eighth of such circumference distant from each other), and the orifice of the fourth being diametrically opposite in such circle to the middle orifice of the other.

EXTENSIONS.

1. COOKING STOVES; C. J. Woolson, Cleveland, Ohio; patented September 9, 1845; extended Sept. 13, 1859.

Claim—The forming of the bottom plate of the oven with a number of tubes or boxes, usually of sheet iron, or other substance, thinner than the bottom plate that descends from it, through the lower flue-space, the same being effected under an arrangement of their respective parts, substantially the same with that described.

2. MODE OF TRIPPING CUT-OFF VALVES; Frederick E. Sickles, City of New York; patented Sept. 19, 1845; extended September 13, 1859.

Claim—Tripping the drop valve of the cut-off by a motion independent of the lifter, in the manner described. Also, combining the wiper that drops the valve of the cut-off, whether working horizontally or vertically, with any of the moving parts of the engine, other than the lifters or their rocking shaft, by means of the sector and arm or arms, by means of which the extent of the cut-off can be regulated at pleasure during the action of the engine, from the full to the least portion of the stroke.

RE-ISSUES.

1. REVOLVING FIRE ARMS; Wm. S. Lavely and James M. Cooper, Assignees of Josiah Ells, Pittsburgh, Penna. patented August 1, 1854; re-issued September 6, 1859.

Claim—1st, The use of a stud in the trigger vibrating laterally, in combination with a bevel-edged hammer, for the purpose of raising the hammer to full cock, and firing the piece by simply pulling the trigger, which, after the discharge of the piece, will regain its position for repeated action, or (as a mere modification of arrangement) the use of a stud in the hammer vibrating laterally, in combination with a bevel-edged trigger, for the purpose specified. 2d, The use of a bevel-edged hammer, with or without a notch in its toe, and trigger with vibrating stud or cam for the trigger spring, for the purpose of causing the hammer, trigger, and revolving breech to assume their proper relative positions at full cock by simply pulling the trigger, and retaining them in that position, and securing the breech from rotation or displacement preparatory to firing. 3d, The notch or depression in the toe of the hammer at the point of contact of the stud and edge of the hammer, in combination with the laterally vibrating stud, for the purpose of preventing the slipping of the stud and the more easy retention of the hammer at the point of full cock. 4th, The mode described of locking the rotating breech at the moment of firing, by means of the locking bolt operated by the trigger, in combination with the hexagonal neck of the rotating breech, which nevertheless permits the breech to be freely rotated by hand or otherwise, when the trigger is not drawn back. 5th, The use of a double trigger spring or spring and lever, for the purpose set forth.

2. ORNAMENTAL CONNEXION OF THE PARTS OF AN IRON FENCE; Henry Jenkins, Cincinnati, Ohio; patented Jan. 30, 1852; re-issued September 6, 1859.

Claim—Forming the ornament or cast iron connexions for a railing, fence, or other article of iron, cast into a divided iron mould, substantially as specified.

3. STRAW CUTTERS; Jacob H. Mumma, Harrisburgh, Pennsylvania; patented January 26, 1858; re-issued September 6, 1859.

Claim—1st, The combined application to straw-cutting machines of a changeable feed gear, with two-edged revolving cutters or blades, when so made that, by changing them end for end on their arms or supports, they shall bring a different cutting edge into action, or when run in either direction, shall always feed in the material in one and the same direction. 2d, The combination of feed rollers acted upon by tappets, and the crushing rollers controlled by gum elastic springs, when arranged in relation to, and acting in connexion with, the cutting apparatus.

4. SEWING MACHINES; John W. Marsh, Oxford, Massachusetts; patented October 27, 1857; re-issued September, 6, 1859.

Claim—1st, The combination of the slide, provided with its guard or its slot or slots with the foot-piece, with its guide and slots, arranged and operating as described. 2d, The combination with the sewing apparatus, or its equivalent, of a movable knife operated by a connexion with the sewing machine, so as to trim or cut the work whilst being sewed, in the manner described.

5. LAMPS; William Fulton, Cranberry, New Jersey; patented August 3, 1858; re-issued Sept. 13, 1859.

Claim—1st, The perforated plate or air distributor, or its equivalent, for the purpose of regulating the elastic force of the air so that it may be presented evenly to the frame (when applied to flat wick lamps), it being placed horizontal. 2d, The perforations in the lower part of the cap, in combination with the perforated or air distributing plate. 3d, The register, formed of the perforations in the top, in combination with the perforated plate or air distributor, and the holes in the lower part of the cap, arranged as described.

6. HEATING ELEVATED OVENS; P. A. Palmer, Troy, New York; patented September 24, 1850; re-issued September 13, 1859.

Claim—The arrangement and combination of reversible flues in elevated ovens of cook stoves, with partition walls, in the manner described. Also, the arrangement and combination of the oven plate, in and with the inner plate and ends of the oven. Also, the arrangement of the damper immediately between the main part of the stove and the bottom or lower part of the elevated oven, thereby combining it with the said oven, the stove, and the double flue, for the purpose of controlling and regulating the heat in its passage into the flues of the said elevated oven, as described, disclaiming any damper found in any stove not having an elevated oven, as set forth.

7. INDIA RUBBER FABRICS; Henry B. Goodyear, Administrator of Nelson Goodyear, deceased, City of New York; patented May 13, 1845; extended for 7 years from May 13, 1859; re-issued September 13, 1859.

Claim—Making fabrics by thoroughly intermingling and incorporating the shearings or clippings of fibrous substances with the gum while rendered plastic by heat, as specified.

8. MACHINE FOR BENDING METAL PIPE; James Perkins and Wm. H. Burnet, Newark, New Jersey; patented October 14, 1856; re-issued September 20, 1859.

Claim—The mandrel, as described, and therewith traversing roller, or its equivalent, for bending coils of metal pipe, and, in combination therewith, the furnace, in the manner set forth.

9. CULTIVATOR TEETH; David B. Rogers, Pittsburgh, Pennsylvania; patented November 1, 1845; re-issued September 20, 1859.

Claim—Making the shank or upper part of cultivator teeth of thin plate-steel, U-shaped or curved round in front, for the purpose of securing the necessary strength to permit the tooth to be made entire, shank and blade of a single piece of metal, and also of enabling the tooth to be secured in its place in the beam by means of a wedge driven into the cavity of the shank.

10. REAPING MACHINES; Cyrus H. McCormick, Chicago, Illinois; patented October 23, 1847; re-issued May 24, 1853; re-re-issued December 21, 1858; re-re-re-issued September 20, 1859.

Claim—The arrangement of a cutting apparatus and a reel, with respect to a driving wheel and a grain wheel, or its equivalent, and a raker's seat, or its equivalent, so that the major part of the weight of the cutting apparatus and reel shall be in advance of the axis of oscillation of the machine on the said wheels, while the raker's seat or stand shall be located behind that axis, and the machine, with the raker thereon, nearly balanced on its axis of oscillation.

11. REAPING MACHINES; Cyrus H. McCormick, Chicago, Illinois; patented October 23, 1847; re-issued May 24, 1853; re-re-issued December 21, 1858; re-re-re-issued September 20, 1859.

Claim—The combination of a tongue, or its equivalent, to draw the machine by, a driving-wheel and gearing arranged at the side of the machine, a short platform, a reel to gather the grain to the platform, and a stand or seat for the raker, fixed upon the machine, so as to enable the raker conveniently to discharge the grain and lay it in gavels upon the ground at the side of the swath, and out of the return path of the horses.

12. REAPING MACHINES; Cyrus H. McCormick, Chicago, Illinois; patented October 23, 1847; re-issued May 24, 1853; re-re-issued December 21, 1858; re-re-re-issued September 20, 1859.

Claim—A seat or stand on the reaping machine for the support of the raker, laterally and in front.

13. REAPING MACHINES; Cyrus H. McCormick, Chicago, Illinois; patented October 23, 1847; re-issued May 24, 1853; re-re-issued December 21, 1858; re-re-re-issued September 20, 1859.

Claim—The combination of the reel, the divider, and the raker's seat or stand, co-operating together in such manner that the grain deposited upon the platform and divider may readily be grasped and discharged from the machine by the raker at his seat.

14. REAPING MACHINES; Cyrus H. McCormick, Chicago, Illinois; patented October 23, 1847; re-issued May 24, 1853; re-re-issued December 21, 1858; re-re-re-issued September 20, 1859.

Claim—The combination, in a reaping machine, of the draft and the gearing, arranged at the side of the machine—two compressors, one arranged at each end of the cutter, the short reel to sweep over the space between the compressors and the short platform.

15. REAPING MACHINES; Cyrus H. McCormick, Chicago, Illinois; patented October 23, 1847; re-issued May 24, 1853; re-re-issued December 21, 1858; re-re-re-issued September 20, 1859.

Claim—The combination of the grain-guarded platform, to receive and retain the cut grain, with the divider and the reel.

16. REAPING MACHINES; Cyrus H. McCormick, Chicago, Illinois; patented October 23, 1847; re-issued May 24, 1853; re-re-issued December 21, 1858; re-re-re-issued September 20, 1859.

Claim—The combination of the reel support at the rear part of the outer side of the platform, with the low flat frame and the divider.

17. REAPING MACHINES; Cyrus H. McCormick, Chicago, Illincis; patented October 23, 1847; re-issued May 24, 1853; re-re-issued December 21, 1858; re-re-re-issued September 20, 1859.

Claim—The arrangement of the frame, the finger-beam, and the platform, and the driving-wheel and gearing, relatively to each other, so as to secure an unobstructed gavelling space at the side of the platform, behind the finger-beam.

18. REAPING MACHINES; Cyrus H. McCormick, Chicago, Illinois; patented October 23, 1847; re-issued May 24, 1853; re-re-issued December 21, 1858; re-re-re-issued September 20, 1859.

Claim—A reaping machine frame, consisting, namely, of two principal beams, crossing each other, and arranged relatively to the supporting wheels, so as to give support to a platform not extending behind the gearing, and without interfering with the cutter on one side or the gavelling space on the other.

19. REAPING MACHINES; Cyrus H. McCormick, Chicago, Illinois; patented October 23, 1847; re-issued May 24, 1855; re-re-issued December 21, 1858; re-re-re-issued September 20, 1859.

Claim—1st, A dividing board, having a surface inclined towards the cutter and platform, and an outer dividing line and an inner dividing line, and acting as described. 2d, The combination of the inclined dividing board with a guide bar. 3d, The combination of a reel with the inclined dividing board. 4th, The combination of a reel with the dividing board and guide bar.

20. MAGNETIC PRINTING TELEGRAPHS; Royal E. House, Binghampton, New York; patented April 18, 1848; re-issued September 20, 1859.

Claim—1st, A series of keys, each corresponding to a character, in combination with a revolving part of a circuit, so that the touching of one of the former may cause the circuit to be broken or closed for the purpose of printing, when the revolving part of the circuit is in a certain required angular position, properly corresponding to the key struck. 2d, A series of keys, each corresponding to a character, in combination with a revolving portion of a circuit and a shaft provided with pins, arranged in a helix, or the equivalents of the whole, acting to cause the circuit to be broken or closed when the revolving part is in a certain angular position, in proper correspondence with the key struck, for the purpose of printing a proper corresponding letter by means of any suitable machinery. 3d, A key-board or series of keys, in combination with a rotating portion of a circuit and a type-wheel, or its equivalent, so governed as to present a proper letter corresponding with a key touched to produce an impression. 4th, In combination with a single circuit of conductors, a key-board or series of keys, a revolving portion of a circuit, and a type-wheel, and these also in combination with a printing press, and with a key-shaft, or either of them. 5th, A series of keys, each corresponding to a character, in combination with a type-wheel having similar corresponding characters, when so connected by any appropriate devices that a certain type shall be in a certain locality when a corresponding key is actuated—and I claim these two elements, in combination with a single circuit of conductors and with a printing apparatus, or either of them. 6th, Actuating or driving a revolving portion of a circuit or a key-shaft, or both of them, by means of a prime-mover acting upon them through a friction connexion, the mode of operation being substantially as specified, and doing away with sudden jars and increasing rapidity of operation, when contrasted with a positive connexion between such parts and a prime-mover, and also permitting the two to move with varying velocities. 7th, Actuating or driving a key-shaft and a revolving portion of a circuit, or either of them, by means of a friction connexion with a prime-mover, when the velocity of such prime-mover is controlled by a governor, or some equivalent for the purpose, which either prevents its moving too fast or increases its velocity when going too slow, or performs both these duties. 8th, Governing or controlling the motions of a prime-mover, which actuates a printing apparatus by the breaking and closing of an electric or galvanic circuit, so that such apparatus is put in operation by the breaking of a circuit and by the closing thereof—and also the controlling of a printing apparatus, so that it shall be permitted to print

when a spring returns to its normal position at the time that a circuit is broken, the mode of operation being substantially such as set forth. 9th, In a printing telegraph, moving the paper to the types to produce an impression on the former, in the manner described, as distinguished from former modes of operation, by which the types were moved towards the paper. 10th, In combination, a revolving type-wheel and a roller, or its equivalent, charged with coloring matter, so as to deposit such matter on the types as they, in succession, come in contact with the roller—and this I claim also when the roller is grooved. 11th, Being aware of the facts that type-wheels have been permitted to revolve, step by step, when controlled by escapements, and when such escapements have been actuated either by a prime-mover governed by a pendulum, or by electric-magnetic force, I claim actuating an escapement which controls the motions of a type-wheel by a prime-mover, whose motions are regulated by the breaking and closing of a circuit, under a mode of operation such as described, whereby a small force, derivable from magnetism, controls any necessary power of a prime-mover, there being a breaking and closing of a circuit correspondent with each vibration of the escapement. 12th, A hydraulic regulator, such as described. 13th, A hydraulic regulator, in combination with a type-wheel, and a printing apparatus, and a prime-mover, and causes the press to print when the type-wheel ceases to move for a longer time than usual. 14th, In combination with a type-wheel and a printing press or apparatus, I claim apparatus such as specified, for making an alarm when that apparatus is permitted or caused to act by the breaking and closing of the same circuit of conductors, which, by its breaking and closing, permits the printing apparatus to come into action.

21. Machines for Threading Screw Blanks; Elliot Savage, Berlin, Assignor to self and Charles Parker, Meriden, Connecticut; patented Nov. 21, 1854; re-issued September 27, 1859.

Claim—The method described of causing the chasing tool to act upon the screw blank in producing both the cylindrical part and the tapering point, that is to say, by so governing the relative positions of each to the other, that while threading the cylindrical portion the chasing tool shall be presented at a right angle to the axis of rotation of the blank, and while cutting the tapering part shall be so inclined acutely to said axis that the line of travel of the face of the chaser shall finally intersect said axis.

22. Machines for Threading Screw Blanks; Elliot Savage, Berlin, Assignor to self and Charles Parker, Meriden, Connecticut; patented Nov. 21, 1854; re-issued September 27, 1859.

Claim—A wood screw of which the entering end is made to taper, in the manner set forth, that is to say, by giving to the core thereof a form bounded in any plane which passes through the axis of rotation, by lines which converge toward, and if produced, will intersect said axis, in contradistinction to the known form wherein the bounding lines in such planes are parallel to said axis.

23. Waste Device for Hydrants; Joshua Register, Wm. George Webb, J. S. Roche, and John McCart, Assignees of John Calver, Baltimore, Maryland; patented April 22, 1856; re-issued Sept. 27, 1859.

Claim—The described arrangement of the plunger relative to the discharge pipe, and capable of elevation proportioned to the capacity of said pipe by forming a chamber in the lower portion of the hydrant for the reception of the contents of the discharge pipe. Also, in combination, the arrangement of the valve, by means for operating it by the spring.

24. Sewing Machines; Joseph W. Bartlett, City of New York, Assignee of O. L. Reynolds, Dover, N. H.; patented May 14, 1850; re-issued September 27, 1859.

Claim—1st, The employment and use in a sewing or tambouring machine of a needle or thread-carrier, having a movable or flexible beard or hook, and also the combination with the said needle or thread-carrier, of a mechanism for closing the beard thereof. 2d, The combination with a bearded instrument, used as before described, of the thread guide, having the motions described, such as shall carry the thread across the path of the bearded instrument, and present it to the action thereof, without carrying the thread around the shank of the said bearded instrument, in the manner described. 3d, The combination of the cam, lever, and guide, with a spring, whereby the thread is presented to the action of the bearded instrument.

25. Clothes Dryers; Samuel Morrill, Andover, New Hampshire; patented November 14, 1856; re-issued September 27, 1859.

Claim—1st, Tilting the reel to the desired position to enable a person to place the clothes on the lines without high reaching, and elevate them in good position to dry, and out of the way of injury. 2d, Arranging and combining with a rotary tilting reel, the ratchet, and a pawl, or their equivalents, for preventing backward rotary motion of the reel as the clothes are placed on the lines, and moved along. 3d, Operating the reel by the combined action of the arm, jointed arm or lever, and loop or staple, or its equivalent.

26. Mowing Machines; Ephraim Ball, Assignor to Ball & Butler, and Ball & Butler, Assignors to Ephraim Ball, aforesaid, Canton, Ohio; patented December 1, 1857; re-issued September 27, 1859.

Claim—1st, The combination of the short curved arm with the bar and finger bar, arranged for joint operation as set forth. 2d, The combination of the coupling arm with bar, wrist, socket, hinge, and short finger beam, as set forth. 3d, Extending the coupling arm outside of the frame, in combination with the front hinges of bar also outside of the main frame, arranged in the manner described, whereby greater freedom of the movement of the cutting apparatus is secured.

27. Mowing Machines; Ephraim Ball, Assignor to Ball & Butler, and Ball & Butler, Assignors to Ephraim Ball, aforesaid, Canton, Ohio; patented December 1, 1857; re-issued September 27, 1859.

Claim—The combination of the independent driving wheel at the grain side of the machine, with the hinged bar to which the short finger beam is rigidly attached, and the hinged coupling arm, whereby the cutting apparatus may rise and fall freely, and the cutters be kept in operation while turning to the left upon uneven ground.

Designs.

1. Handles of Spoons and Forks; Philo B. Gilbert, City of New York; dated September 6, 1859.
2. Carpet Pattern; Elmira J. Ney, Lowell, Massachusetts, Assignor to the Lowell Manufacturing Company; dated September 6, 1859.
3. Handles of Spoons, Forks, &c.; Henry Hubbard, City of New York; dated September 13, 1859.
4. Skating or Riding-cap for Ladies; Eliza A. Murdock, Boston, Massachusetts; dated September 20, 1859.
5. Cooking Stove; John Martino, Assignor to D. Stuart and J. R. Peterson, Philadelphia, Penna.; dated September 20, 1859.
6. Cylinder Stoves; John Martino and James Horton, Assignors to D Stuart and J. R. Peterson, Philadelphia, Pennsylvania; dated September 20, 1859.
7. Sewing Machine; S. B. Ellithorp, City of New York; dated September 27, 1859.
8. Gas Cocks, &c.; B. M. Johnson, City of New York; dated September 27, 1859.

MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

Details of the Steamer Great Eastern. Collected and estimated by Chas. H. Haswell, New York.

Hull built by John Scott Russell & Co. Paddle-wheel engines designed by John Scott Russell and built at Millwall Works. Propeller engines built by James Watt & Co., Soho Works.

Hull.

Length on deck over all,		692 feet.	
Length on deck, from fore part of stem to after part of stern post, above the spar deck,		680 "	
Breadth of beam at midship section,		83 "	
" over paddle-wheel guards,		120 "	
Depth of hold to spar deck,		56 "	3 inches.
" " main deck,		48 "	3 "
" " lower "		41 "	3 "
" " berth "		34 "	3 "
Height from rail to under side of bottom,		62 "	4 "
Length of engine and boiler space, under lower deck,		350 "	
Tonnage,	22,500.		

*Water-wheel Engines.

Description—Oscillating.

" of Boilers—Horizontal tubular—furnaces at each end—one smoke-pipe in common for each set of two.

Diameter of cylinders, four of			74 inches.
Length of stroke,		14 feet.	
Diameter of water-wheels,		56 "	
Length of blades,		13 "	
Depth "		3 "	
Number "	thirty.		
" of boilers,	four.		
Length "		17 "	6 "
Breadth "		17 "	9 "
Height "		13 "	6 "
Number of furnaces (five at each end),	ten.		
Width "		2 "	11 "
Length of grate bars,		7 "	
Number of tubes,	3200.		
Diameter " external,			3 "
Thickness "	No. 12 wire gauge.		
Length "		5 "	4 "
Diameter of smoke-pipe,		5 "	10 "
Height "		86 "	
Area of grate surface,		370 "	
Heating surface, tubes alone,		17,600 "	
Thickness of plates, Sides, $\frac{3}{8}$.	Bottom,	7-16. inches.	
Front tubes, $\frac{1}{2}$.	Back tubes,	9-16. "	
Maximum pressure of steam *in pounds*,	25.		
" revolutions *per minute*,	16.		
Point of cutting off,	one-fourth.		
Weight of boilers, *without water*, each	51 tons.		
" water,	39 "		

* The term "water-wheel" is according to the author's copy.

PROPELLER ENGINES.

Description.—Horizontal direct-acting.
" of boilers.—Same design as those for the water-wheel engines.

Diameter of cylinders,		84 inches
Length of stroke,		4 feet.
Diameter of propeller,		24 "
Pitch "		44 "
Number of blades,	ten.	
" boilers,	six.	
Length "		17 " 6 "
Breadth "		18 " 4 "
Height "		13 " 10 "
Number of furnaces (six at each end),	twelve.	
Width "		2 " 5 "
Length of grate bars,		7 " 6 "
Number of tubes,	4920	
Diameter " external,		3 "
Thickness "	No. 10 wire gauge.	
Length "		5 " 6 "
Diameter of smoke-pipes, (three,)		6 "
Height "		86 "
Area of grate surface,		406 "
Heating surface, tubes alone,		27,300 "
Thickness of plates, Sides, 7-16. Bottom,		½ inch.
Front tubes, ½. Back tubes,		⅝ "
Maximum pressure of steam *in pounds,*	25.	
" revolutions *per minute,*	55.	
Point of cutting off,	one-fourth.	
Weight of engines and boilers,	1500 tons.	
" boilers, *without water,* each,	55 "	
" water, each,	45 "	
Capacity of coal bunkers, in tons of coal,	12,000 "	
Consumption of coal per hour, estimated,	10 "	
Draft of water at load line,		30 feet.
" " light "		20 "
Area of immersed midship section at light draft of 20 feet,		1360 sq. ft.
" " load " 30 "		2180 "

HULL.—Frame of wrought iron plates. Bottom doubled at an interval of 2 feet 10 inches, to a height of 39 feet from under side. Outer and inner plates ¾ of an inch thick—connected, fore and aft, by 36 fore and aft webs, ½ an inch thick—2½ feet apart at side of keel, and running to 4¼ feet at top of sides, crosswise by webs every 10 feet. These webs are secured to the outer and inner plates by angle iron.

Description of coal, . . Bituminous and Anthracite.

Details and Remarks.—Four decks. Spar deck, 2 feet 5 ins. deep. Ten water-tight athwartship bulkheads. Two transverse bulkheads for 350 feet. Launching draft, 14 feet 6 ins.; displacement equal to 10,500 tons.

Each pair of cylinders of water-wheel engines is arranged to be detached from the other by a friction clutch, and each cylinder can be detached from connexion with the other.

All surfaces of cylinders, steam-chests, and steam-pipes are jacketed and heated by steam from an auxiliary boiler.

Estimated power, water-wheel engines at 11 revolutions per minute and 15 lbs. pressure. Cut-off at ⅓. 3000 horses; at 16 revolutions and 25 lbs. Cut-off at ¼. 5000 horses. Propeller engines at 42 revolutions and 16 lbs. pressure. Cut-off at ¾. 5000 horses.

Boilers proved with a cold pressure of 50 lbs. Each set of boilers has an independent steam engine (donkey). There are two auxiliary engines for hoisting, pumping, &c. Area of canvass, 6500 square yards. Chains, cables, $2\frac{7}{8}$ inches diameter. Anchors, chains, and capstans, 250 tons.

Weight of propeller,	36 tons.
" " shaft,	60 "
" rudder stock (18 ins. diameter),	22 "

Two propeller steamers swung at sides, abaft of wheel-house, of 120 tons burthen each.

Accommodation.—1st class passengers, 800. 2d class passengers, 2000. 3d class passengers, 1200.

Result of trial trip.—Draft of water, forward 22 feet 2 ins.; aft, 25 feet—mean, 23 feet 7 inches.

Water-wheel engines: pressure of steam, 15·5 lbs. Cut-off at $\frac{4}{14}$ths. of stroke. 11 to 11·5 revolutions. Indicated power, 3330 horses.

Propeller engines: pressure of steam 16 lbs. Cut-off at $\frac{3}{4}$ of stroke. 41 revolutions. Indicated power, 4800 horses.

Speed: with jib and fore spankers set, having an area of canvass of 2500 yards, 14·5 knots.

Consumption of fuel: 3·5 lbs. per horse power per hour.

For the Journal of the Franklin Institute.

Particulars of the Steamer Adriatic.

This steamer having lately been purchased by the North Atlantic Steamship Company, is being fitted for sea, and at the same time her accommodations for passengers have been so altered as to meet the requirements of the new and particular service for which she is intended.

The essential modification regarding the hull is the addition of a deck extending to the line of her rail, but not enclosed at the sides beyond the line of saloon, officers' state rooms, &c. Regarding the engines, an alteration in the operation of the valves is being made by the Novelty Iron Works—a trial of the engine will be made very shortly, and so soon as approved of she will be put upon the route between New York and Aspinwall.

Hull built by James and George Steers. Machinery by Novelty Iron Works, New York.

Hull.—

Length over all,	351 feet 8 inches.
Length on deck, from fore part of stem to after part of stern post, above the spar deck,	344 " 6 "
" at load line,	343 " 10 "
Breadth of beam at midship section, *molded,*	48 " 8 "
" " " *extreme,*	50 "
Depth of hold,	25 "
" to spar deck,	33 " 2 "
Length of engine and boiler space, including side bunkers,	130 "
Tonnage, custom-house,	4144.

ENGINES.—Description of engines—Oscillating.

Diameter of cylinders,			101 inches.
Length of stroke,		12 feet.	
Maximum pressure of steam in pounds,	26.		
" revolutions per minute,	14.		
Point of cutting-off,	one-half.		
Draft of water at above pressure and revolutions,		18 "	6 "
Area of immersed midship section at load draft,		880 "	
Diameter of paddle-wheels,		40 "	
Length of blades,		12 "	
Depth "		3 "	
Number "	32.		
Area of blade surface,		2144 "	

BOILERS.—Description of boilers—Vertical tubular.

Number of boilers,	8.		
Length "		20 feet	1½ inches.
Breadth "		11 "	3 "
Height " exclusive of steam chimney,		14 "	
Number of furnaces,	48.		
Width "		2 "	9 "
Length of grate bars,		8 "	
Number of tubes,	13,064.		
Diameter " external,			2 "
Length "		8 "	
Diameter of smoke pipes, (two,)		7 "	
Height "		40 "	
Heating surface (fire and flues),	30,758 sq. ft.		
Combustion,	Natural draft.		
Capacity of coal bunkers, in tons of coal,	1200.		
Consumption of coal per hour,	4 tons.		
Draft of water at load line,		20 "	
" " light "		17 "	1½ "
Displacement " "	5233 tons.		
Weight of engines, *in pounds*,	825,000.		
" boilers, without water,	836,232.		
" water in boilers,	1,075,200.		
Floor timbers at throats, *molded*,			22 "
" " *sided*,			13 and 16 "
Distance of frames *apart at centres*,			33 and 36 "
Frame strapped with diagonal and double laid iron straps,			⅞ by 5 "
Masts and rig—Brig.			
Intended service,	New York to Aspinwall.		
Description of coal,	Anthracite or Bituminous.		

Memoranda.—Launching draft, 10 feet 2 ins. Weight of hull, 2041 tons. Weight of engines, boilers, water, coal, spars, &c., 2400 tons.

Average displacement per inch from launching draft to light load line (17 feet 1½ ins.), 26·43 tons. Average displacement per inch from light load line to load line (20 feet), 28·75 tons. Average displacement per inch from load line to 21 feet 6 ins., 31·5 tons.

Piston rod 14 inches in diameter. Shafts 26·5 inches in diameter. Air-pump 42 inches in diameter by 5 feet stroke of piston. Condensers, Pirsson's fresh water, having 24,000 square feet of surface. Diameter of tubes, ¾-inch, of No. 17 wire gauge.

Accommodations—Cabin passengers, 350 ; 2d cabin, 200 ; Steerage passengers, 1000. Freight, 800 tons measurement. C. H. H.

*On the Manufacture of Malleable Iron and Steel.**
By Mr. Henry Bessemer.

[From a Paper read before the Institution of Civil Engineers, London.]

Attention was directed, in the early part of the Paper, to the ordinary mode of manufacturing iron by the puddling process; in the course of which the iron, after it "came to nature," was gathered into balls, and was then removed, as quickly as possible, to the squeezer, where much of the fluid scoria, with other mechanically mixed impurities, was driven out, leaving a mass or billet of iron, composed of thousands of separate fragments of metal, the entire surface of every one of which was, more or less, coated with dry oxide, or fluid silicate of the oxide of iron. The great pressure exerted by the squeezer sufficed to so far remove the fluid coating of the contiguous particles as to bring their surfaces into actual contact, and consequently to effect an union at such parts. But the whole of the matter thus displaced could not find its way between the interstices of the mass, and therefore it became locked in its numerous cavities, producing points of weakness and separation in the metal. No amount of after working, or rolling, could wholly displace the portions of cinder, dry oxide of iron, and of sand, which thus became mixed up with and were diffused throughout the mass, causing flaws and cracks in the iron, all, more or less, objectionable.

Now, if these imperfections were the natural and inevitable consequences of the conditions under which malleable iron was at present produced, it followed that defects of a similar character must also of necessity exist in steel, produced by the puddling process. The granular condition of the metal and its exposure to heat and oxygen, could not fail, in both cases, to oxidize the entire surfaces of the numerous molecules to be united into one mass; the admixture of scoria and other matters, from the furnace, was equally certain to result; and also the difficulty of bringing each particle of the metal to the same degree of decarbonization and refinement existed as in the making of iron, with the additional inconvenience arising from some portions of the metal becoming entirely decarbonized, and being converted into soft malleable iron.

Iron thus presented a most unfavorable contrast with the other malleable metals, all of which were free from sand or scoria; they had no hard and soft parts, and required no welding together of separate molecules, but they were perfectly homogeneous, and free from all mechanical admixture with foreign substances. Gold, silver, copper, zinc, tin, and lead, owed this valuable exemption from the defects universally found in puddled iron, simply to the fact that they were purified and refined in a fluid state, and while still fluid were formed into ingots, whereby the cohesion of every particle in the mass was insured. If, then, the refining of other malleable metals, while in a fluid state, and their formation into cast ingots, rendered all such metals more sound and homogeneous than iron, while it did not lessen their extreme ductility, why should iron for ever remain an exception to the general

*From the Lond. Artizan, July, 1859.

rule? It might be truly answered, that hitherto the excessively high temperature required to fuse and to maintain pure iron in a fluid state, had interposed an insuperable barrier, for the highest heat of the furnaces only sufficed to show that fluidity was a possible condition of that metal.

It need not, therefore, be a matter of surprise, that when Mr. Bessemer first proposed to convert crude pig iron into malleable iron, while in a fluid state, and to retain the fluidity of the metal, for a sufficient time to admit of its being cast into moulds, without the employment of any fuel in the process, his proposition was looked upon by many as a chimera, or as the mere day dream of an enthusiast; but it was nevertheless fully recognised and supported by many of the scientific men of the day. The same deep conviction of the truth on which the new process was based, and which led Mr. Bessemer to bring it before the British Association, in 1856, had since determined him (in spite of the opinions then pronounced against the process) to pursue one undeviating course until the present time, and to remain silent for years, under the expressed doubts of those who predicted its failure, rather than again bring forward the invention until it had been practically and commercially worked; and there had been produced by it both iron and steel, of a quality which could not be surpassed by any iron or steel made by the tedious and expensive process now in general use.

The want of success which attended some of the early experiments was erroneously attributed, by some persons, to the "burning" of the metal, and by others to the absence of cinder, and to the crystalline condition of cast metal. It was almost needless to say, that neither of the causes assigned had any thing to do with the failure of the process, in those cases where failure had occurred. Chemical investigation soon pointed out the real source of difficulty. It was found that, although the metal could be wholly decarbonized, and the silicum be removed, the quantity of sulphur and of phosphorus was but little affected; and as different samples were carefully analyzed, it was ascertained that red shortness was always produced by sulphur, when present to the extent of $\frac{1}{10}$th per cent., and that cold shortness resulted from the presence of a like quantity of phosphorus; it, therefore, became necessary to remove those substances. Steam and pure hydrogen gas were tried, with more or less success, in the removal of sulphur, and various fluxes, composed chiefly of silicates of the oxide of iron and manganese, were brought in contact with the fluid metal, during the process, and the quantity of phosphorus was thereby reduced. Thus many months were consumed in laborious and expensive experiments; consecutive steps in advance were made, and many valuable facts were elicited. The successful working of some of the higher qualities of pig iron caused a total change in the process, to which the efforts of Messrs. Bessemer and Longsdon were directed. It was determined to import some of the best Swedish pig iron, from which steel of excellent quality was made, and tried for almost all the uses for which steel of the highest class was employed. It was then decided to discontinue, for a time, all fur-

ther experiments, and to erect steel works at Sheffield, for the express purpose of fully developing and working the new process commercially, and thus to remove the erroneous impressions so generally entertained in reference to the Bessemer process.

In manufacturing tool steel of the highest quality it was found preferable, for several reasons, to use the best of Swedish pig iron, and, when converted into steel by the Bessemer process, to pour the fluid steel into water, and afterwards to re-melt the shotted metal in a crucible, as at present practised in making blister steel, whereby the small ingots required for this particular article were more perfectly and more readily made.

It was satisfactory to know that there existed in this country vast, and, apparently, inexhaustible beds of the purest ores, fitted for the process. Of the hematite alone, 970,000 tons were raised annually, and this quantity might be doubled or trebled, whenever a demand arose. It was from the hematite pig iron, made at the Workington Iron Works, that most of the larger samples of iron and steel exhibited were made. About 1 ton 13 cwt. of ore, costing 10s. per ton, would yield 1 ton of pig metal, with 60 per cent. less lime, and 20 per cent. less fuel, than were generally consumed when working inferior ores; while the furnaces using this ore alone yielded from 220 to 240 tons per week, instead of, say 160 to 180 tons per week when working with common iron-stone. The Cleator Moor, the Weardale, and the Forest of Dean Iron Works, also produced an excellent metal for this purpose.

The form of converting-vessel, which had been found most suitable, somewhat resembled the glass retort used by chemists for distillation. It was mounted on axes, and was lined with "ganister," or road drift, which lasted during the conversion of thirty or forty charges of steel, and was then quickly and cheaply repaired or renewed. The vessel was brought into an inclined position, to receive the charge of crude iron, during which time the tuyeres were above the surface of the metal. As soon as the whole charge was run in, the vessel was moved on its axes, so as to bring the tuyeres below the level of the metal, when the process was at once brought into full activity, and twenty small, though powerful jets of air sprung upwards through the fluid mass; the air expanding in volume, divided itself into globules, or burst violently upwards, carrying with it a large quantity of the fluid metal, which again fell back into the burning mass below.

The oxygen of the air, appeared in this process, first to produce the combustion of the carbon contained in the iron, and at the same time to oxidize the silicum, producing silicic acid, which uniting with the oxide of iron, obtained by the cumbustion of a small quantity of metallic iron, thus produced a fluid silicate of the oxide of iron or "cinder," which was retained in the vessel, and assisted in purifying the metal. The increase of temperature which the metal underwent, and which seemed so disproportionate to the quantity of carbon and iron consumed, was doubtless owing to the favorable circumstances under which combustion took place. There was no intercepting material to

absorb the heat generated, and to prevent its being taken up by the metal, for heat was evolved at thousands of points, distributed throughout the fluid, and when the metal boiled, the whole mass rose far above its natural level, forming a sort of spongy froth, with an intensely vivid combustion going on in every one of its numberless, ever-changing cavities. Thus, by the mere action of the blast, a temperature was attained in the largest masses of metal, in ten or twelve minutes, that whole days of exposure in the most powerful furnace would fail to produce.

The amount of decarbonization of the metal was regulated, with great accuracy, by a metre, which indicated on a dial the number of cubic feet of air that had passed through the metal; so that steel of any quality or temper could be obtained with the greatest certainty. As soon as the metal had reached the desired point (as indicated by the dial), the workmen moved the vessel, so as to pour out the fluid malleable iron, or steel, into a founder's ladle, which was attached to the arm of a hydraulic crane, so as to be brought readily over the moulds. The ladle was provided with a fire-clay plug at the bottom, the raising of which, by a suitable lever, allowed the fluid metal to descend in a clear vertical stream into the moulds. When the first mould was filled, the plug valve was depressed, and the metal was prevented from flowing until the casting ladle was moved over the next mould, when the raising of the plug allowed this to be filled in a similar manner, and so on, until all the moulds were filled.

The casting of large masses of a perfectly homogeneous malleable metal into any desired form rendered unnecessary the tedious, expensive, and uncertain operation of welding now employed wherever large masses were required. The extreme toughness and extensibility of the Bessemer iron was proved by the bending of cold bars of iron, 3 ins. square, under the hammer into a close fold, without the smallest perceptible rupture of the metal at any part; the bar being extended on the outside of the bend from 12 inches to $16\frac{3}{4}$ inches, and being compressed on the inside from 12 inches to $7\frac{1}{4}$ ins., making a difference in length of $9\frac{1}{2}$ ins. between what, before bending, were the two parallel sides of a bar 3 ins. square. An iron cable, consisting of four strands of round iron, $1\frac{1}{2}$ ins. diameter, was so closely twisted, while cold, as to cause the strands at the point of contact to be permanently imbedded into each other. Each of these strands had elongated $12\frac{1}{2}$ inches in a length of 4 ft., and had diminished one-tenth of an inch in diameter, throughout their whole length. There were also exhibited some steel bars, 2 ins. square, and 2 ft. 6 ins. in length, twisted cold into a spiral, the angles of which were about 45 degrees; and some round steel bars, 2 ins. in diameter, bent cold under the hammer, into the form of an ordinary horse-shoe magnet, the outside of the bend measuring 5 ins. more than the inside.

The steel and iron boiler plates, left without shearing, and with their ends bent over cold, also afforded ample evidence of the extreme tenacity and toughness of the metal; while the clear even surface of the railway axle and piece of malleable iron ordnance were examples

of the perfect freedom from cracks, flaws, or hard veins, which formed so distinguishing a characteristic of the new metal. The tensile strength of this metal was not less remarkable, as the several samples of steel tested in the proving-machine, at Woolwich Arsenal, bore, according to the reports of Colonel Eardley-Wilmot, R. A., a strain varying from 150,000 lbs. to 162,000 lbs. on the square inch, and four samples of iron boiler-plate from 68,314 lbs. to 73,100 lbs; while, according to the published experiments of Mr. W. Fairbairn, Staffordshire plates bore a mean strain of 45,000 lbs., and Low Moor and Bowling plates, a mean of 57,120 lbs. per square inch.

There was also another fact of great importance in a commercial point of view. In the manufacture of plates for boilers and for ship-building, the cost of production increased considerably with the increase of weight in the plate; for instance, the Low Moor Iron Company demanded £22 per ton for plates weighing $2\frac{1}{2}$ cwt. each, but if the weight exceeded 5 cwt., then the price rose from £22 to £37 per ton. Now, with cast ingots, such as the one exhibited, and from which the sample plates were made, it was less troublesome, less expensive, and less wasteful of material, to make plates weighing from 10 to 20 cwt. than to produce smaller ones, and indeed there could be but little doubt that large plates would eventually be made in preference, and that those who wanted small plates would have to cut them from the large ones. A moment's reflection would therefore show the great economy of the new process, in this respect; and when it was remembered that every riveted joint in a plate reduced the ultimate strength of each 100 lbs. to 70 lbs., the great value of long plates for girders and for ship-building would be fully appreciated.

At a time when the manufacture of ordnance occupied so large a share of public attention, it was interesting briefly to point out the great facility which the Bessemer process afforded of forming masses, both of malleable iron and of steel, of a size suitable for the heaviest ordnance, without any welding together of separate slabs, or the more costlier mode of building up the gun with pieces accurately turned and fitted together. Many attempts have been made to produce wrought iron ordnance, and this object had been successfully accomplished in the case of the large gun produced at the Mersey forge. But, however perfect this one gun might be, the time required to make it, and its immense cost, manifestly rendered it still a great desideratum to produce guns rapidly and cheaply of a material equal to or greater in tensile strength than wrought iron, and, if possible, free from the liability which that material had to flaws and to deterioration, during its long exposure to a welding heat. It was believed that the Bessemer process supplied this desideratum, as masses of cast malleable metal could be produced of 10 to 20 tons in weight in a single piece, and two or three such pieces might be conveniently made by the same apparatus in one day. The metal so made might be either soft malleable iron or soft steel. In order to prove the extreme toughness of such iron, and the strain to which it might be subjected without bursting, several cast and hammered cylinders were placed cold under the steam-hammer,

and were crushed down without the least tearing of the metal, as was shown by the samples exhibited. These cylinders were drawn from a round cast iron ingot of only 2 ins. greater diameter than the finished cylinder, and in the precise way in which a gun would be treated; they might, therefore, be considered as short sections of an ordinary 9-pounder field-piece. The tensile strength of the samples, as tested at the Royal Arsenal, was 64,566 lbs. per sq. in., while the tensile strength of pieces cut from the Mersey gun gave a mean of 50,624 lbs. longitudinally, and 43,339 lbs. across the grain; thus showing a mean of 17,550 lbs. per sq. in. in favor of the Bessemer iron.

If it was desired to produce ordnance by merely casting the metal, the ordinary founding process might be employed with the simple difference, that the iron, instead of running direct from the melting furnace into the mould, must first be run into the converting vessel, where in ten minutes it would become steel, or malleable iron, as was desired, and the casting might then take place as in the ordinary manner. The small piece of ordnance exhibited served to illustrate this important manufacture; and it was interesting, in consequence of its being the first gun that was ever made in malleable iron without a weld or joint. The importance of this fact would be enhanced when it was known that conical masses of this pure tough metal, of from 5 to 10 tons in weight, could be produced at Woolwich at a cost not exceeding £6 12s. per ton, inclusive of the cost of pig iron, remelting, waste in the process, labor, and engine power. The conical ingots being cast in iron moulds, the great delay in moulding in loam would be avoided; and as the iron moulds employed might be removed from the casting-pit within an hour after the metal had been poured into them, the tedious interval of three days now required by the cast iron guns before removal would be also avoided, thus immensely increasing the capabilities of the foundry.

If it was assumed that these advantages were about equal to the cost of hammering the cast ingot, then, by this process, it would be practicable to produce guns of any size, in hammered cast steel, or malleable iron, ready for the boring mill, at about the same cost as the cast iron guns now in use; but if the weight of the guns could be reduced by 20 or 25 per cent., in consequence of their superior strength, then an actual saving in that proportion would be effected in the first cost of every gun so made. These important facts had been laid before the government, and their advantages were stated to be fully appreciated by Colonel Eardley-Wilmot, the Superintendent of the Royal Gun Factories, who had evinced a great interest in the progress of the invention from its earliest date, and to whose kindness the author was indebted for the many valuable trials of the tensile strength of the various samples of metal that have been submitted for investigation.

It would be interesting to those who were watching the advancement of the new process to know that it was already rapidly extending itself over Europe. The firm of Daniel Elfstrand & Co., of Edsken, who were the pioneers in Sweden, had now made several hundred tons of excellent steel by Bessemer's process. Another large manufactory had

since been started in their immediate neighborhood, and three other companies were also making arrangements to use the process. The authorities in Sweden had fully investigated the whole process, and had pronounced in favor of it. The large steel circular saw plate exhibited was made by Mr. Göranson, of Geffle, in Sweden, the ingot being cast direct from the fluid metal, within fifteen minutes of its leaving the blast furnace. In France, the process has been for some time carried on by the old established firm of James Jackson & Son, at their steel works, near Bordeaux. This firm was about to manufacture puddled steel on a large scale. They had already got a puddling furnace erected and in active operation, when their attention was directed to the Bessemer process, the apparatus for which was put up at their works last year; and they were now extending their field of operations by putting up more powerful apparatus at the blast furnaces in the Landes. There were also four other blast furnaces in the south of France in course of erection, for the express purpose of carrying out the new process.

The irons of Algeria and Saxony had produced steel of the highest quality.

Belgium was not much behind her neighbors; the process was now being carried into operation at Liege, where excellent steel had been made from the native coke iron; while in Sardinia preparations were also being made for working the system. Russia had sent to London an engineer and a professor of chemistry to report on the process, and Professor Müller, of Vienna, and M. Dumas and others from Paris, had visited Sweden, to inspect and report on the working of the new system in that country.

The Bessemer process might therefore be now fairly considered an accomplished commercial fact, and in a country like England, where the manufacture of iron and steel formed so important a branch of the national industry, and was so necessary an element in all the great manufacturing operations, it must be admitted that an impartial examination of the new system was of the highest importance, not only to those immediately concerned in the production of malleable iron and steel, but to the country generally.

That the process admitted of further improvement, and of a vast extension beyond its present limits, the author had no doubt; but those steps in advance would, he imagined, result chiefly from the experience gained in the daily commercial working of the process, and would most probably be the contributions of the many practical men who might be engaged in carrying on the manufacture of iron and steel by this system. Hitherto the process had been brought into its present practical and commercial state, without recourse to any of the numerous inventions which were supposed by the several authors to be essential to the success of the system; but any real improvement that might be brought forward would be cordially received and encouraged.

*Jensen's Marine Engine Governor.**

At the Institution of Mechanical Engineers, on Wednesday, the 4th of May, a paper was read by Mr. Henry Maudslay, descriptive of this apparatus, the object of which is to prevent the engine from running off at an excessive speed, when the resistance of the water is suddenly removed by the pitching or rolling motion of the vessel in stormy weather. This governor consists of a cylinder, A, at the bottom of which a communication or opening, B, is made through the side of the vessel, as near as possible to the propeller or paddle wheel; in this

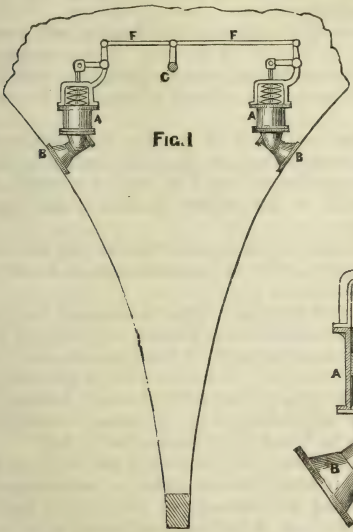
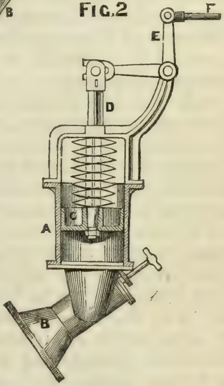


FIG. 1

FIG. 2



cylinder a piston, C, works, attached to the piston rod, D, which is connected by means of bell-cranks, E, and rods, F, with the spanner or lever arm, G, of the throttle valve in the steam-pipe of the engine. When the motion of the vessel causes the propeller to be less deeply immersed, the pressure of water in the cylinder, A, is diminished, the piston, C, of which is forced down by the spring above, thereby closing the throttle valve to the required extent, and preventing the speed of the engine from increasing; also, when the propeller is more deeply immersed, the pressure in the cylinder, A, is increased, and raises the piston, C, opening the throttle valve, and admitting more steam to the engine, so as to maintain the required speed: the object being to control the speed of the engine before it has time to sensibly change,

* From the Lond. Artizan, June, 1859.

instead of waiting for a change to bring the governor into action. Fig. 1 is a view of the apparatus as applied to a vessel; the apparatus is shown in Fig. 2 detached and to an enlarged scale.

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*The Origin of the Electric Telegraph.**

Dr. Hamel, of the Imperial Academy of Sciences at St. Petersburg, who has communicated to that Academy the results of his laborious researches regarding the early history of the Electric Telegraph, shows how the construction of the very first telegraph, worked by a galvanic battery, originated.

On the 6th of August of this year, it will be just half a century since it was completed at Munich, in Bavaria. It appears that an event in connexion with the war brought on by Austria against France fifty years ago, in 1809, caused the galvanic telegraph to be invented and made.

The Austrian army had on the 9th of April in that year begun to cross the river Inn, and to enter Bavaria. King Maximilian had hardly been informed of this, when he, on the 11th, with his family, in all haste, retired from Munich to the western frontier of his kingdom, to the town of Dillingen.

He took with him Baron von Montgelas, who was at the head of two of the most important branches of administration in Bavaria, the Foreign and Home Departments.

By means of the line of Chappe's optico-mechanical telegraphs, established all the way from the French frontier to Paris, the Emperor Napolean I. got there the information of the Austrian army having entered Bavaria much sooner than it had been thought possible by the Bavarians, namely on the 12th, and he, without delay, departed from Paris for Bavaria on the way to his army. He came so totally unexpected to Dillingen, that he found King Maximilian in bed.

There is no doubt that, to the speedy arrival of the Emperor Napolean I. in the midst of his army, Bavaria owed its deliverance from the Austrians. Munich had been already, on the 16th of April, occupied by the Austrian General Jellachich, but he was in less than a week after, on the 22d, obliged to withdraw, and King Maximilian was again able to enter into his capital.

This event, so vitally important for Bavaria and Munich, must there have directed a special attention to the utility of telegraphs.

Baron Montgelas had been witness of the surprise caused by the French Emperor's unexpected arrival at Dillingen. Under his extensive administration was also the Munich Academy of Sciences. Dr. Samuel Thomas von Soemmerring, the well known anatomist and physiologist, who had been since 1805 a member of that Academy, was from time to time invited to come to dine with the minister Montgelas at Bogenhausen, near Munich, where he lived. This was the case on the 5th of July, 1809, when the minister expressed to him the wish to

* From the Journal of the Society of Arts, No. 338.

get from the Academy of Sciences proposals for telegraphs, having, it is to be supposed, in view no other but improved optical or mechanical telegraphs.

Soemmerring, who had, like Humboldt, very early paid attention to galvanism, in hopes of being able to make its study useful to clear up some of the most mysterious portions of physiology, and who also had now closely followed and noted the brilliant chemical discoveries made by Davy with the galvanic battery in the laboratory of the Royal Institution in London, at once resolved to try whether the evolution of gases from the decomposition of water by the action of the galvanic current might not be applied to telegraphic purposes.

From the time of the above mentioned dinner at the minister's, he gave himself no rest in his endeavors to construct a galvano-chemical telegraph.

On the 6th of August he considered the object of his ardent desire attained. He noted that day: "Tried the entirely finished instrument, which completely answers my expectations." He was then able to work with the telegraph he had invented through 724 feet of wire. Twelve days later he telegraphed through no less than 2000 feet, and on the 29th of August, he exhibited his telegraph in action before a meeting of the Academy of Sciences.

He now wished to send his instrument to the National Institute in Paris. On the 4th of November, the chief surgeon of the French army, Dominique Jean Larrey, with whom Soemmerring had been long acquainted, came to Munich on his way to Paris from the army, after the battles of Aspern, Esslingen, and particularly at Deutsch Wagram, where Napoleon I. had on the field created him a Baron. Larrey most readily offered to take the telegraph with him, and even assisted at the packing of it.

After his departure, Soemmerring composed a French memoir, describing his invention, which he forwarded to Larrey, in Paris, with a letter, wherein he expressed his hope that he would also exhibit the telegraph to the Emperor.

Dr. Hamel has ascertained in Paris, that Larrey presented Soemmerring's telegraph to the Institute on the 4th of December (1809), and that Biot, Carnot, Charles and Monge were appointed to report on it.

Soemmerring to his great delight, succeeded in accomplishing on the 23d of August, 1810, his very ingenious mechanical contrivance for causing the gas bubbles rising from the wire-points in the water to ring an alarm bell.

Ten days previous to that, on the 13th of August, Baron Schilling, then attached to the Russian Mission at Munich, saw for the first time Soemmerring's telegraph. He became enthusiastically fond of the new art of signalizing, which promised to become so all-important, and he directed the attention of many other persons to it. In 1811 he introduced to Soemmerring, Colonel Count Jeroslas Potocky, who took a telegraph made for him to Vienna, and exhibited it on the 1st of July to the Emperor Francis I., in the presence of the Empress and

the Archdukes Charles and John. His Majesty expressed the wish to have a telegraphic communication established between Vienna, and his country palace Laxenburg, a distance of nine miles. Baron Schilling was, as stated in the *Journal* a short time since,* the medium by which the British Envoy and Minister Plenipotentiary at Munich, the Honorable Frederic James Lamb, brother to Lady Palmerston, and subsequently the second Lord Melbourne, on the 12th of July, 1816, witnessed experiments with Soemmerring's instrument, being the first Englishman who ever saw a galvanic telegraph.

Again, Baron Schilling was the person who, at a later period, made in St. Petersburg the first electro-magnetic telegraph, which he, in 1835, two years before his death, exhibited to the meeting of the German naturalists at Bonn. Dr Hamel has explained to the St. Petersburg Academy, in detail, how Baron Schilling's telegraphic contrivance found, in 1836, its way from the borders of the Rhine to England, and so gave the impulse to the spreading of that most wonderful application of science, by means of which, ere long, all inhabited parts of the globe will be put in telegraphic intercommunication.

* Journal of the Society of Arts, Vol. VII, p. 235.

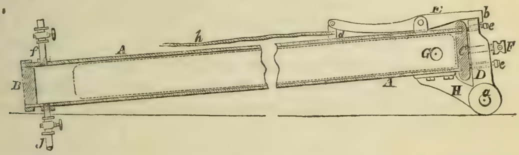
An improved method of effecting the separation of the fibres of wood, for the manufacture of paper therefrom, which is also applicable to the separation of the fibres of flax or other substances for the manufacture of textile fabrics, and also to the separation of other substances for similar or other purposes,—being a Communication. Patented by William Edward Newton.* Dated London, June 21st, 1858.

It is well known that the fibres of most kinds of wood are arranged in the form of very minute tubes, in which the sap circulates. Now the improved method of separating these fibres, constituting this invention, consists in subjecting the wood, while in a strong cylinder or box, to the action of steam, air, gas, hot water, or other fluid, under a high pressure, for the purpose of charging its tubes, as well as the spaces between them, and then causing it to be suddenly projected from the cylinder or box into the atmosphere or into a partial vacuum, where, by the expansive force acting within and upon the tubes, they will burst open, and cause the complete separation of the fibres. The same process applies to the separation and opening of flax and other analogous fibrous materials.

The figure exhibits a longitudinal central section of a cylinder, or, as (from its operation) it may be termed, a gun, for effecting the separation of the fibres of wood preparatory to their conversion into paper pulp. This gun may be of any suitable length and calibre, and composed of a piece or pieces of lap-welded iron tubing A, permanently closed at one end with a stopper B, and at the other end fitted with a movable head or cap C. The cap is to be fitted after the fashion of a valve, or with a suitable packing to be capable of making a steam-

*From Newton's London Journal, April, 1859.

tight joint. In order to secure this cap C, firmly in place, and thereby close the gun, a bracket-arm H, is bolted to one side of the gun, for the purpose of carrying by a hinge-joint *a*, a strong lever D, which is capable of being brought to a position across the cap C, and secured in that position by a hook *b*, at one end of the lever E, which is attached to the gun on the opposite side to that of the hinge-joint *a*, of the first lever by a fulcrum pin *c*. The other end of the lever E has hinged to it a prop piece *d*, which, when resting upon the side of the gun, secures the hook *b*, upon the lever D. F, is a screw, working in the lever D, for the purpose of securing the cap closely to the mouth or muzzle of the gun; and *e*, *e*, are screw-bolts, which attach the cap loosely to the lever D. G, is a steam-pipe, for admitting steam from a boiler to the gun next the cap C. This pipe should be furnished with a stop-cock or valve. *f*, is the pipe at the other end of the gun, for the escape of air when the steam is admitted. *j*, is a pipe, for allowing any water to run back from the gun to the boiler when desired.—This gun is to be placed in a slightly inclined position, so that a small



quantity of water may settle near the breech, and should either be mounted in a very strong frame, capable of sustaining it against recoil, or be otherwise supported at its breech for that purpose. The wood may be put in, either in the form of a log, as large as can be conveniently inserted, or in smaller pieces, and in any case the gun may be nearly filled with it, provided that a space be left near the breech for the collection of a small quantity of water. It is better that the wood should be cut while green, and, before being put in the gun, it should be soaked in water for several days, or till the sap is displaced by the water. When the wood has been put in, the lever D, is brought up and secured by bringing down the hook *b*, of the lever E, upon it, and by setting up the prop piece *d*, of the latter lever; and the screw F, is then screwed up to close the cap C, tightly. The next thing to be done is to expel the air from the gun, which is done by opening the stop-cock in the pipe *f*, and admitting steam slowly from the boiler by the pipe G, till it issues copiously from the air escape-pipe *f*, when the latter may be closed entirely, and steam admitted freely by the steam-pipe. The temperature in the boiler should be about 390° Fahr., which will give a pressure of above two hundred pounds per square inch. After steam has been admitted to the gun for a few minutes, the temperature of all the water that remains in the wood, not displaced by the steam or converted into steam, will be the same as that in the boiler; and a quantity of water that will have been collected in the lowest part of the gun, by reason of the condensation of the steam

in contact with the interior surface of the gun, and by the expulsion from the wood, will be of the same temperature also. The cap may then be set free, by an attendant, standing some distance behind the muzzle, tripping up the prop piece *d*, by pulling a string *h*, attached thereto, and depressing the rear end of the lever E. The hook *b*, will thus be raised from the lever D, and the pressure of the confined steam will force off the cap C. The steam, which is instantly generated from the water in the rear portion of the gun, by the reduction of the pressure, will force the wood out of the gun, and as it emerges, the expansion of the steam in and among its tubes, and the instantaneous flashing into steam of a portion of water remaining in it, will effect a perfect separation of its fibres, leaving them in a state in which they may either at once, or after bleaching, be introduced to the pulp-mill or other machinery for their reduction into pulp, or into a suitable state for conversion into paper. The fibres, it may be stated, though scattered about, are nearly all left within seventy or eighty feet from the muzzle of the gun, and may be collected without difficulty.

The patentee claims, "separating the fibres of wood and other fibrous substance by charging the same with steam, air, or other gaseous body or hot water, in a cylinder or other suitable receptacle substantially similar to that herein described, and afterwards suddenly subjecting the substance under operation to a sufficiently diminished atmospheric pressure, to cause its disruption, by the expansion of the fluid or gaseous body within it."

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*On a New Method of Manufacturing Ammonia.**

By ALEXANDER WILLIAMS, Neath.

The importance of ammonia and its sister compound, nitric acid, in an agricultural point of view, as forming probably the chief sources whence the nitrogen of plants is obtained, and the high commercial price of compounds containing either of these substances, have led practical chemists to look upon any new method of obtaining them as one of the great desiderata of the day.

The atmosphere, with its water, contains the elements necessary for the formation both of ammonia and nitric acid, and during the passage of electricity both are formed; but so far as our present knowledge extends, and from a long series of experiments on the subject, I am led to believe that it will be some time ere the Society's premium will be claimed "for the production of ammonia or nitric acid *from their elements*, by methods which would admit of practical application."

After having been engaged for many years in experiments on this subject, I have arrived at the conclusion that, except under peculiar circumstances, nitrogen and hydrogen in their gaseous or elementary state, will not combine together in sufficient quantities to be commercially available. To make them unite in any quantity it is necessary that the nitrogen should, in its nascent state, be brought in contact

*From the Journal of the Society of Arts, No. 339.

with the hydrogen, when union will take place, but this combination is much more readily effected if both be in their nascent state.

To obtain nascent nitrogen it is, of course, necessary to decompose one of its compounds, and thus far I had only arrived at the same conclusion as every one else. The object of this paper is to direct attention to a bye-product of one of our most important chemical manufactories, which is exactly adapted for our purpose.

The animal and vegetable kingdoms have been so thoroughly searched by the shoals of manure manufacturers of this and other countries, that the discovery of any new nitrogen compound in these kingdoms seems to be altogether improbable; one is therefore naturally led to the mineral kingdom, and our ideas as naturally become fixed on nitrate of soda as the cheapest source. It has been known for years that nitric acid, or other compounds of nitrogen and oxygen, could be converted into ammonia, and therefore the use of a nitrate would present no novelty; but if we can obtain the nascent nitrogen from nitrate of soda as a bye-product, we shall have made a grand step towards facilitating the manufacture of ammonia.

This, I believe, I have accomplished. Of the thousands of tons of nitrate of soda annually imported into this country, I have been told, on good authority, that about half is used in the manufacture of sulphuric acid. It is well known that sulphuric acid is usually manufactured in a large leaden chamber having attached to it a burner where sulphur is kept constantly burning, by which it is converted into sulphurous acid. The great difficulty of the manufacture is to give another atom of oxygen to this sulphurous acid ($S\ O_2$) to convert it into sulphuric acid ($S\ O_3$), and it is for this purpose that the nitrate of soda (cubic nitre) is used, and usually in the following manner: —one or more movable iron pots are placed in the burner. Into each of these pots is put, as often as required, a few pounds of nitrate of soda, and with it a sufficient quantity of sulphuric acid to decompose it. Sulphate of soda (salt cake) remains in the pot, whilst nitric acid and probably other compounds of nitrogen and oxygen pass with the sulphurous acid into the leaden chamber. The sulphurous acid ($S\ O_2$) gains an additional atom of oxygen from the nitrogen compounds, and becomes converted into sulphuric acid ($S\ O_3$) which, with water afforded by steam jet or otherwise, condenses as a liquid at the bottom of the chamber, whilst a quantity of gas escapes.

Such is a rough sketch of the first part of the process usually adopted for making sulphuric acid or oil of vitriol, and the gas which escapes from the vitriol chamber must now be the subject of our inquiry.

On referring to Dr. Ure, our great authority on manufacturing chemistry, I found that he asserts that in a properly working chamber nothing but nitrogen gas should escape; in fact, that the whole of the oxygen should be taken up, and that the nitrogen should be reduced to its elementary condition. This, although the generally received opinion of the manufacturing chemists of the present day, appeared to me fallacious; as, on considering the affinities, I did not think it

probable that sulphurous acid, although it is known to form a compound with nitric oxide ($N\ O_2$), should, under the circumstances occurring in the vitriol chambers, be able to decompose it. Experiments were immediately instituted to ascertain the truth, and they led to the knowledge of the fact that a chemical compound of nitrogen and oxygen was escaping, and not free nitrogen. What particular compound of nitrogen and oxygen it is has not been ascertained, as the fact of its being a *chemical* compound was sufficient for the purpose intended, viz: of applying this waste product for the manufacture of ammonia.

At the commencement of the year 1856, I transferred a portion of the gases escaping from a vitriol chamber to my own laboratory, and there and then succeeded in converting them into ammonia.

This was an important step, but I did not feel satisfied until I had tried the process on the large scale; therefore, in November in the same year, an arrangement was entered into for this purpose with Messrs. Lewis and Pollard, of the Pontardawe Vitriol Works, whose kind assistance in the matter I take this opportunity of acknowledging.

The apparatus fitted up was of the following description:—A furnace was built above the exit tube of one of their vitriol chambers, and a brick gas retort, about 14 inches in diameter, 8 feet long, and open at both ends, was passed through its whole length. This retort was filled with charcoal, and kept at a red heat; the exit tube of the chamber, and a steam jet to supply the hydrogen, were attached to one end, whilst to the other end was fixed an upright leaden cylinder filled with coke, and moistened with diluted sulphuric acid. On passing the waste gases and steam through the retort containing red hot charcoal, both were decomposed, the oxygen of each uniting with the charcoal to form carbonic acid ($C\ O_2$); the nitrogen and hydrogen combining to form ammonia ($N\ H_4\ O$, or, without water, $N\ H_3$); then together, probably forming carbonate of ammonia ($N\ H_4\ O_1\ \ C\ O_2$), which was again decomposed by the diluted sulphuric acid, the sulphate of ammonia being found remaining in solution. This solution was then evaporated, and in July, 1857, I first had the pleasure of obtaining any quantity of crystals of sulphate of ammonia, by this process, from a vitriol chamber in actual work.

It was the intention at that time to have secured the invention by patent, and therefore, when the above comparatively rough result had been obtained, the further prosecution of the experiments to ascertain yield, &c., was not proceeded with, lest the process should become public. Several circumstances have since prevented their renewal. I therefore merely wish to offer the process as it is to those interested in the matter, hoping some one else may apply it more profitably than I have, and feeling sure that—as there seems no reason why it should not be successfully carried out—it will be the means of advancing the "arts, manufactures, and commerce" of this country, by increasing the supply of one of our most valuable fertilizers.

Perhaps it may be thought that the process is only adapted to such gases as escape directly from the chamber, and that, if any of the late

improvements as coke cylinders, &c., be used it cannot be applied; but provided the assertion be correct that sulphurous acid is incapable of reducing compounds of nitrogen and oxygen to their elementary state, then the process will be available after all these improvements have been carried out, and not only to the waste gases, but also, by a slight modification, to any nitrogen compounds that may have been absorbed by the dilute sulphuric acid, and be given off in its evaporation, so that really a very minute portion only of the nitrogen contained in the nitrate of soda need be lost.

With regard to the quantity obtainable by these means. I have not as yet been able to ascertain with certainty the amount of nitrate of soda imported, but, as already stated, it appears probable that about half of the whole quantity arriving in this country is used in the manufacture of oil of vitriol, or sulphuric acid. Now, every thousand tons of this cubic nitre, allowing 10 per cent. for impurities, would, if the whole of its nitrogen were converted into chloride of ammonia ($N\,H_4\,O$), yield about 565 tons of this substance, which, at £30 per ton, would be worth nearly £17,000, and there are, doubtless, many thousands of tons of nitrate of soda used by the vitriol makers of this country.

Although these figures give, of course, no approximation to the practical yield likely to be afforded by this process, yet they enable us to form a very good idea of the enormous amount of valuable material daily wasted. The process suggested, or some modification of it, may render this waste unnecessary, and thus save the pocket of the manufacturer, and, at the same time, benefit the public.

A new form of Barometer. By M. de Celles.

This consists of two tubes united at right angles. The vertical branch being closed and the instrument filled as usual. The horizontal tube takes the place of the cistern, and a very slight diminution in the vertical column produces a great change in the length of the horizontal one—which is of much less diameter than the other. A steel index in front of the horizontal column will serve to register.

Acad. Sciences of Paris.

*Water in Lighthouses.**

Prof. Faraday writes to the *Times*, giving some useful information as to the purification of water contaminated with chloride of lead from salt spray resting on the leads of lighthouses, &c., whence rain-water is collected. The water thus contaminated is peculiar in this, that it does not lose the poisoning substance either by boiling or by exposure to air. The process of purification is exceedingly simple, for if some powdered chalk or whiting is put into the cistern in which such rain-water is collected, and stirred up occasionally after rain, the water may, with the greatest facility, be obtained in a perfectly fit state for all culinary and domestic purposes. The Trinity-house has supplied this information to all the cases needing it which have come to its knowledge.

* From the Lond. Builder, No. 870.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, November 17, 1859.

John Agnew, Vice-President, in the chair.

Isaac B. Garrigues, Recording Secretary.

The minutes of the last meeting were read and approved.

Donations to the Library were received from the Statistical Society, London; the Catholic University of Ireland, Dublin; the K. K. Geologischen Reichsanstalt, and the K. K. Geographischen Gesellschaft, Vienna, Austria; L. A. Huguet-Latour, Esq., Montreal, Canada; the Providence Athenæum, Providence, Rhode Island; and Prof. J. Aitkens Meigs, Philadelphia, Pa.

Donation to the Cabinet of Models and Minerals from Prof. John C. Cresson, Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement of the receipts and payments for the month of November, was read.

The Board of Managers and Standing Committees reported their minutes.

Thirty-three resignations of membership in the Imstitute were read and accepted.

Candidates for membership in the Institute (17) were proposed, and the candidates proposed at the last meeting (17) were duly elected.

George M. Alsop exhibited an atmospheric spring for railroad cars, invented by him.

The principle on which this spring was constructed, was the application of a suitable fluid to surround a hermetically sealed air ball of rubber, inclosed in a water-tight chamber or vessel, having a flexible cover or diaphragm of rubber and leather, the latter being moulded so as to allow of considerable motion without being strained. The object of making use of a fluid to surround the air vessel, was stated to be to remedy the defect in the construction of all other air springs, viz: the gradual escape of the air, which the inventor thought would be accomplished by his arrangement, as the fluid would form the medium through which the pressure exerted upon the spring would act upon the air in the air vessel; and as the pressure within and outside the ball would always be the same, there would be no tendency in the air to escape.

Mr. Joseph Hoskin exhibited one of his "Sighted Adjustable Spirit Levels." It consists of a brass stock of box shape, planed and scraped truly. One end has a sight hole, and the other a glass affixed, across which the cross, of silk, passes. This sight is intended to do away with the necessity of using straight edges or lines when leveling from one object to another over an intervening space. The tubes are made adjustable by screws, and all of the usual sort; one for horizontal and the other for vertical work. The apparatus is got up with ease, and will, no doubt, exactly suit its intended purpose.

Abstract of Meteorological Observations for September, 1859; made in Philadelphia, Adams, and Somerset Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.

1859. Sept.	Barometer. Mean.	Barometer. Mean daily range.	Thermometer. Mean.	Thermometer. Daily oscillation.	Thermometer. Mean daily range.	Force of vapor. 2 P.M.	Relative humidity. 2 P.M.	Rain.	Prevail'g winds.
	Inch.	Inch.	°	°	°	Inch.	Per ct.	Inches.	Direc.
1	29·731	·013	67·5	22½	1·3	·591	89		S W.
2	29·724	·081	67·8	16½	2·0	·255	29		W.
☽ 3	29·820	·117	68·7	27	5·2	·351	36	0·175	S W.
4	29 841	·075	72·3	15	5·3	·614	68		W.
5	30·035	·194	60·8	13	11·5	·412	77	0·175	N N'E.
6	30·077	·041	63·8	18	5·3	·326	42		N W.
7	30·116	·046	64·0	22	2·2	·376	46		N W.
8	30·142	·026	65·2	23	1·5	·299	36		N N W.
9	30·120	·022	66·0	24	1·2	·428	51		S W.
10	30·044	·076	70·5	22	4·5	·464	47		S S W.
11	29·714	·330	73·3	17	2·8	·592	60		S W.
○ 12	29·523	·224	72·3	17½	1·7	·347	34		W.
13	29·462	·064	69·0	24	3·3	·450	44		(var.)
14	29·787	·324	60·0	24	9·0	·265	34		N W.
15	30·099	·313	56·5	19½	3·5	·215	35		(var.)
16	30·035	·065	57·8	10	4·7	·426	82	0·900	E.
17	29·506	·529	60·3	9	3·2	·473	88	3·202	N E.
18	29·759	·253	64·2	20	5·5	·468	62		N W.
☾ 19	29·753	·066	67·7	26	5·2	·549	57		S W.
20	29 728	·037	69·0	14	6·7	·658	90	0·822	S W.
21	29·767	·039	66·0	13	5·0	·612	89	1·577	N E.
22	29·804	·042	63·2	10	5·8	·549	89	0·818	N E.
23	29·838	·050	66·2	13½	6·0	·608	80		N W.
24	29·770	·083	69·0	15½	3·2	·497	54		S W.
25	29·765	·019	67·7	15	1·3	·524	62	0 110	N E.
● 26	29·803	·039	67·2	18½	2·2	·554	64		(var.)
27	29·849	·046	68·8	21	1·7	·587	61		WSW.
28	29·884	·068	72·0	16	3·8	·546	52		W.
29	30·110	·226	64·8	16	7·2	·448	61		(var.)
30	30·131	·053	63·8	22	2·3	·389	50		N E.
Means	29·858	·119	66·2	18	4·1	·462	59	7·779	N 70½ W.

GETTYSBURG, Adams Co. Lat. 39° 49′ N. Long. 77° 18′ W. Height 624 feet. Prof. M. JACOBS, Obs.

1859. Sept.	Barometer. Mean.	Barometer. Mean daily range.	Thermom. Mean.	Thermom. Mean daily range.	Rain.	Prevail'g. winds
	Inch.	Inch.	°	°	Inch.	Direc.
1	29·367	·004	66·7	0·4		WSW.
2	29·391	·087	64·7	8·0		W.
☽ 3	29·433	·094	65·8	10 5	0·010	S W.
4	29·479	·105	69·3	7·8		(var.)
5	29·666	·187	57·7	11·7	0·130	S W.
6	29·778	·112	58·3	6·0		N N E.
7	29·798	·022	59·0	3·3		S.
8	29·804	·012	60·0	2·3		(var.)
9	29·773	·035	63·3	3 3		S W.
10	29·670	·110	71·0	7·7		S S W.
11	29·299	·364	71·7	1·3	0·010	S W.
○ 12	29·152	·147	69·3	2·3		W.
13	29·123	·112	65·7	5·7	0·100	(var.)
14	29·431	·309	60·0	7·0		N W.
15	29·720	·288	55·0	5·0		N.
16	29·651	·065	57·0	6·7	} 3·386	N N E
17	29·194	·457	58·3	6·3		N N E.
18	29·436	·242	62·7	6·0		(var.)
☾ 19	29·320	·116	66·7	9·3		S S W.
20	29·285	·051	68·3	8·7	0·335	S S E.
21	29·313	·028	68·3	5·0	1·650	S.
22	29·419	·106	62·0	7·7	0·716	N N E
23	29·508	094	66·7	4·7	0·005	N N E.
24	29·522	·072	63·7	3·3		N W.
25	29·526	·053	63·0	2·3		N.
● 26	29·491	·039	63·0	2·0		(var.)
27	29·481	·042	64·7	1·7		S.
28	29·548	·067	67·7	3·7		(var.)
29	29·767	·209	62·0	5·7		(var.)
30	29·775	·042	64·0	2·0		S E.
Means	29·503	·122	63·5	5·2	6·342	S 84° W

SOMERSET, Somerset Co. Lat. 40° N. Long. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.

1859. Sept.	Barometer. Mean.	Barometer. Mean daily range.	Thermom. Mean.	Thermom. Mean daily range.	Force of vapor. 2 P.M.	Relative humidity. 2 P.M.	Rain.	Prevail'g winds
	Inch.	Inch.	°	°	Inch.	Per ct.	Inch.	Direc.
1	27·594	·003	60·0	1·0	·416	52		W.
2	27·617	·056	56·0	6·7	·375	59		W.
☽ 3	27·640	060	61·7	9·7	·498	55	0·120	S W.
4	27·709	·087	61·7	7·3	·416	57		W N W
5	27·817	·108	60·0	2·3	·391	54		(var.
6	27·917	·100	55·0	5·0	·300	48		N N E.
7	27·896	·022	57·3	3·0	·411	60		(var)
8	27·904	·009	58·0	6·0	·435	57		E.
9	27·910	·013	64·3	6·3	·549	57		W.
10	27 828	·087	66·0	4·3	·574	69		W S W.
11	27·552	·272	67·3	2·7	·654	81	0·635	W.
○ 12	27·435	·117	63·0	4·3	422	54		W.
13	27·388	·084	54·3	8·7	·452	94	0·037	(var)
14	27·641	·253	51·7	5·3	·311	56		W N W
15	27·830	·189	54·3	2·7	·355	62		S E.
16	27·721	·110	54 0	5·7	·390	93	} 2·218	S E.
17	27·519	201	56·0	2·0	·452	94		(var.)
18	27·641	·122	62·0	6·7	·554	64		N W.
☾ 19	27·511	·131	66·3	4·3	·676	66	0·253	S W.
20	27·457	·040	65·0	8·0	·564	89	0·172	S S E.
21	27·458	·005	66·7	1·7	·608	80	0·062	S E.
22	27·585	·127	67·0	3·7	·563	61		W.
23	27 696	·107	61·7	5·3	·469	67	0·025	W.
24	27·650	·046	56·3	5·3	·439	88	0·304	W.
25	27 626	·029	59·7	4·0	·443	65		(var.)
● 26	27·654	·028	60·3	2·7	·523	67	0·009	(var.)
27	27·646	·008	61·7	4·0	·577	84	0·243	S W.
28	27·766	·120	60·0	6·3	·509	74		N W.
29	27·856	·090	59·0	4·3	·469	67		S S E.
30	27·853	·021	58·3	4·0	·429	77		S E.
Means	27·677	·088	60·1	4·8	·474	68	4·678	S 63½ W.

Abstract of Meteorological Observations for September, 1859; made in Dauphin, Huntingdon, Centre, and Allegheny Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

HARRISBURG, Dauphin Co. 40° 16′, N. 76° 15′, W. Height, 300 feet. JOHN HEISELY, M. D., Observer.

1859. Sept.	Barometer. Mean.	Barometer. Mean daily range.	Ther. Mean.	Ther. Mean daily range.	Rain.	Pre-vail'g winds.
	Inch.	Inch.	°	°	Inch.	Direc.
1	29·637	·007	69·3	0·6		S W.
2	29·652	·089	68·0	5·3		N W.
☽ 3	29·691	·093	70·0	8·0		S E.
4	29·762	·111	72·7	6·0		W.
5	29·958	·199	63·0	9·7		S E.
6	30·051	·093	63·7	2·0		N W.
7	30·047	·023	63·0	2·0		S.
8	30·065	·018	63·7	0·7		N.
9	30·051	·014	68·0	4·3		N.
10	29·919	·132	74·7	6·7		S E.
11	29·580	·339	74·7	3·3	0·072	S W.
○ 12	29·409	·171	73·3	2·7		N W.
13						?
14	29·695		62·3			N W.
15	30·058	·364	56·3	6·0		S.
16	29·932	·126	56·0	5·0	} 5·063	E.
17	29·495	·437	60·3	4·3		(var.)
18	29·698	·203	65·3	4·7		W.
☾ 19	29·609	·092	68·7	7·3		S W.
20	29·577	·049	71·7	7·7		S.
21	29·609	·032	70·3	4·0	} 3·83	E.
22	29·701	·092	62·0	9·7		(var.)
23	29·755	·054	68·7	6·7		(var.)
24	29·719	·059	68·3	0·3		(var.)
25	29·692	·040	67·3	1·0		W.
● 26	29·7[illegible]8	·046	68·0	1·3		W.
27	29·7[illegible]2	·024	68·7	2·0		S.
28	29·811	·095	70·7	4·0		W.
29	30·027	·216	64·3	6·3		W.
30	30·053	·052	65·3	3·0		S E.
Means	29·783	·117	66·8	4·5	8·965	s 81° w

HUNTINGDON, Huntingdon Co. Lat. 40° 35′ N. Long. 78° 3′ W. Height, 734 feet. W. BREWSTER, M. D., Observer.

1859. Sept.	Barometer. Mean.	Barometer. Mean daily range.	Ther. Mean.	Ther. Mean daily range.	Force of vapor. 2. P. M.	Relative humidity. 2 P.M.	Rain.	Pre-vail'g winds.
	Inch.	Inch.	°	°	Inch.	Per ct.	Inch.	Direc.
1	29·232		61·7		·540	60		(var.)
2	29·248	·074	62·3	8·7	·408	41		W.
☽ 3	29·272	·081	63·0	12·7	·349	40		(var.)
4	29·340	·109	65·7	9·3	·349	40		(var.)
5	29·507	·166	58·7	8·3	·313	52		(var.)
6	29·613	·107	57·3	5·3	·231	34		(var.)
7	29·595	·019	55·3	2·7	·348	51		N E.
8	29·620	·023	56·7	1·3	·384	52		S.
9	29·576	·040	62·3	5·7	·435	48		S E.
10	29·462	·114	69·3	7·0	·522	51	0·018	(var.)
11	29·173	·289	69·0	5·0	·667	85	0·197	S E.
○ 12	29·034	·139	65·7	6·7	·421	45		S E.
13	29·010	·121	62·0	7·7	·475	69		W.
14	29·297	·287	58·3	3·7	·244	37		W.
15	29·581	·284	51·0	7·3	·255	46		S E.
16	29·466	·115	56·0	7·7	·375	93	} 3·170	N E.
17	29·155	·311	57·7	5·0	·452	94		N.
18	29·283	·128	60·7	5·7	·366	52		N W.
☾ 19	29·162	·121	68·7	8·7	·573	58		S E.
20	29·117	·057	67·7	6·3	·631	80		(var.)
21	29·138	·021	66·7	3·0	·665	77	0·280	(var.)
22	29·240	·102	64·7	4·7	·594	76		(var.)
23	29·303	·064	66·3	3·0	·469	52		(var.)
24	29·302	·031	60·7	5·7	·516	84	0·041	S E.
25	29·272	·030	63·0	3·0	·608	80		(var.)
● 26	29·295	·023	61·7	4·7	·469	52		(var.)
27	29·285	·012	66·0	4·3	·536	54	0·055	(var.)
28	29·385	·101	65·3	4·0	·567	68		W.
29	29·564	·178	58·3	7·0	·448	61		S E.
30	29·554	·039	60·7	5·7	·451	73		(var).
Means	29·336	·110	62·1	5·9	·459	60	3·761	s. 54° e.

FLEMING, Centre Co. 40° 55′ N. 77° 53′ W. Height, 780 feet. S. BRUGGER, Obs.

1859. Sept.	Thermom. Mean.	Thermom. Mean daily range.	Rain.	Prevailing winds.
	°	°	Inch.	Direc.
1	59·3	3·7		N W.
2	58·0	8·0		N W.
☽ 3	67·7	12·3		S W.
4	62·3	11·3		N W.
5	56·3	10·0		W.
6	55·3	7·0		(var.)
7	55·7	1·0		N W.
8	57·3	5·0		(var.)
9	62·3	5·0		N W.
10	70·0	7·7	0·160	W.
11	69·7	3·7	0·162	N W.
○ 12	62·7	7·0		N W.
13	61·3	4·7	0·020	N W.
14	54·0	7·3		(var.)
15	49·3	4·7		S W.
16	52·0	8·0	} 3·180	E.
17	59·0	7·0		N W.
18	61·3	7·0		(var.)
☾ 19	62·3	6·3		(var.)
20	70·7	7·0	0·100	(var.)
21	68·7	2·0	0·775	S E.
22	66·3	3·0	0·175	E.
23	65·3	3·0		(var.)
24	64·7	3·3		(var.)
25	64·0	2·0	0·113	(var.)
● 26	64·3	3·0		(var.)
27	65·3	3·0	0·170	S W.
28	67·3	7·3		S W.
29	57·7	9·7		(var.)
30	61·0	5·3		(var.)
Means	61·7	5·8	4·855	WEST.

TARENTUM, Allegheny Co. 40° 37′ N. 79° 46′ W. Height 950 feet. J. H. BAIRD, Obs.

1859. Sept.	Thermometer. Mean.	Thermometer. Mean daily range.	Prevailing winds.
	°	°	Direc.
1	61·7		S W.
2	58·3	10·0	W.
☽ 3	64·0	13·0	S W.
4	60·0	10·7	W.
5	55·7	4·3	(var.)
6	52·7	5·0	N.
7	55·3	2·7	N W.
8	55·7	2·3	(var.)
9	63·0	7·3	S.
10	69·7	8·0	S W.
11	71·3	3·7	S W.
○ 12	64·7	6·7	S W.
13	63·0	6·3	(var.)
14	53·7	9·3	W.
15	57·7	4·7	N E.
16	57·0	5·3	S.
17	59·0	2·0	W.
18	57·3	4·3	W.
☾ 19	65·7	11·0	S W.
20	68·0	7·7	(var.)
21	70·7	2·7	(var.)
22	66·3	4·3	S.
23	60·7	5·7	S.
24	60·0	2·0	S W.
25	62·3	2·3	?
● 26	60·3	2·7	S W.
27	63·0	4·7	?
28	58·7	6·3	W.
29	58·7	2·7	N E.
30	63·7	5·0	(var.)
Means	61·3	5·4	s. 61° w.

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